JUL 21 1947

MEDICAL LIBRARY

INTERSTATE POSTGRADUATE MEDICAL ASSOCIATION

Postgraduate Medicine

VOLUME I, Number 6 JUNE 1947

DIAGNOSIS AND MANAGEMENT OF PERIPHERAL NERVE INJURIES

Robert A. Groff, M. D., ASSISTANT PROFESSOR OF NEUROSURGERY, UNIVERSITY OF PENNSYLVANIA GRADUATE SCHOOL OF MEDICINE

NEW DEVELOPMENTS IN SURGERY OF THE HEART

Claude S. Beck, M. D., PROFESSOR OF NEUROSURGERY, WESTERN RESERVE UNIVERSITY SCHOOL OF MEDICINE, CLEVELAND

CARE AND MOBILIZATION OF THE PARAPLEGIC

Oliver S. Waugh, M. D., PROFESSOR OF SURGERY, UNIVERSITY OF MANITOBA SCHOOL OF MEDICINE, WINNIPEG

Diagnostic Clinics

MANAGEMENT OF HYPERTENSION

Irvine H. Page, M. D., *A. C. Corcoran*, M. D. AND *R. D. Taylor*, M. D., CLEVELAND CLINIC

CARCINOMA OF THE STOMACH

Roy D. McClure, M. D., SURGEON-IN-CHIEF, HENRY FORD HOSPITAL, DETROIT

PSYCHOGENIC RHEUMATISM AND TRUE RHEUMATIC DISEASE

Philip S. Hench, M. D., ASSOCIATE PROFESSOR OF MEDICINE, UNIVERSITY OF MINNESOTA GRADUATE SCHOOL OF MEDICINE, ROCHESTER, MINNESOTA

International Assembly—St. Louis Auditorium, St. Louis, Mo., October 14 to 17 inclusive, 1947, 32nd year.

stop itching!

The patient with severe pruritus not only requires—but demands—prompt relief from his torment. And—aside from the discomfort—if itching is not controlled, scratching may result in secondary infection. • Patients suffering the distressing torment of ivy and oak poisoning particularly welcome the *soothing, cooling* relief provided by 'CALIGESIC' Analgesic Calamine Ointment. • This greaseless, bland cream possesses marked analgesic, anesthetic, astringent, protective properties which quickly arrest the desire to scratch and minimize the possibility of secondary infection. • 'CALIGESIC' Ointment is useful also in treatment of sunburn, summer prurigo, insect bites and other pruritic skin conditions. It does not stain the skin and may be used safely on infants. • Each 100 Gm. of 'CALIGESIC' Analgesic Calamine Ointment contains: Calamine 8.00 Gm., Benzocaine 3.00 Gm., Hexylated Metacresol 0.05 Gm. • Supplied in 1½- and 4-oz. tubes. Sharp & Dohme, Philadelphia 1, Pa.

'CALIGESIC'

SHARP & DOHME

Analgesic Calamine Ointment (Greaseless)

Diagnosis and Management of Peripheral Nerve Injuries

ROBERT A. GROFF*

UNIVERSITY OF PENNSYLVANIA GRADUATE SCHOOL OF MEDICINE, PHILADELPHIA

THE purpose of this paper is to review the problems of diagnosis, surgical treatment, and the management of the postoperative period of patients with peripheral nerve injuries in respect to the experience that has been gained during the war and, in this way, give the accepted methods of present-day treatment.

My war experiences were most valuable and profitable. In a combat zone where we were located in Assam, India, we repaired between 200 and 300 acute nerve injuries, with most of the patients being Chinese. Because of the system of evacuation, there was virtually no opportunity for us to follow the various patients and see the results of treatment. Furthermore, because of the location of our hospital, there was no opportunity to utilize new methods other than those of our own ingenuity. My experiences, therefore, were confined to diagnosis, surgical treatment, and only a brief period of observation of the effects of physical therapy treatment upon these patients.

*Assistant Professor of Neurosurgery, University of Pennsylvania Graduate School of Medicine, Philadelphia, Pennsylvania.

NOTE: Read before the meeting of the Interstate Postgraduate Medical Association of North America, Cleveland, Ohio, October 15 to 18, 1946.

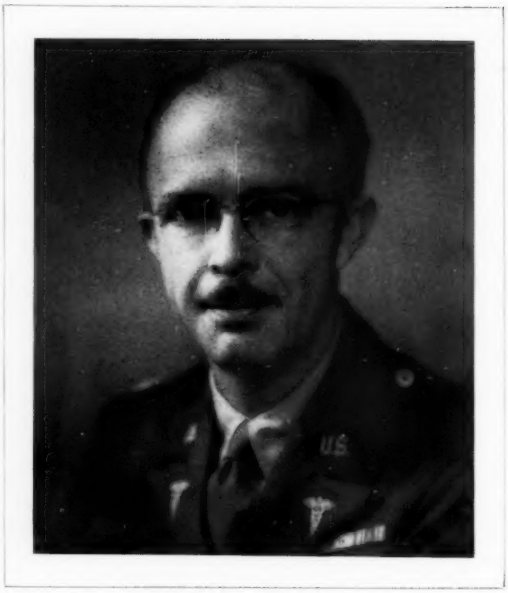
PROBLEMS OF DIAGNOSIS

In the majority of our patients the nerve injury was recognized when the patient was examined. I say this advisedly. There were a number of injuries that went by unnoticed. Aside from the volume of work which necessarily prevented thorough examination, the main reason for this oversight was either that the type of injury commanded the entire attention of the medical officer or that its location did not suggest the possibility of a nerve injury. In the beginning of our experience, when wounds were associated with severe fractures, the nerve injury was either overlooked or simply ignored. Profiting by our experiences, it became a routine procedure to test grossly for evidence of a nerve injury in all patients with injuries to the extremities or to the neck. This should likewise be the routine for civilian practice. How can this be done most easily?

As you know, practically all peripheral nerves are mixed nerves—that is, they contain both motor and sensory fibers. Testing for pain sensation with a pin in the constant area supplied by each of the main nerves will reveal the state of function of that particular nerve. A differential diagnosis between tendon and nerve injury can be made in this way. A pos-

sible exception of this rule is an injury to the radial nerve which may not cause a loss of sensation, even though the nerve has been completely severed in the region of the elbow joint, because the sensory branch comes off at a higher level than normal. The characteristic wristdrop, however, will reveal the paralysis without difficulty. After a sensory clue as to a nerve injury has been obtained, the type of deformity of the part is noted, and an examination is then made of individual muscles for weakness or paralysis.

The initial examination for nerve injury cannot be overemphasized, for it may serve as a very valuable piece of information when a cast has been removed or a wound has healed. If a nerve paralysis is found at this later date and it is known that none was present directly after the injury, the cause is either pressure from the cast, bone callus, or scar tissue. However, if it were not known that these nerves were intact beforehand, one cannot be certain that the nerve was not torn at the time of the accident. It is likewise well to remember that nerves may be injured without a break in the skin.



ROBERT A. GROFF

THE next problem which arises after a nerve injury has been discovered is differential diagnosis between the anatomical and physiological interruption. By anatomical interruption is meant that the nerve has been torn or severed partially or completely; physiological interruption, on the other hand, is a temporary loss of the conductive power of the nerve but without any disturbance in the continuity of the nerve. The significance of this diagnostic problem can be obtained from the following facts. In reviewing our records of operative patients, we found that in about 10 or 12 cases we had explored needlessly, since the nerve, when exposed, appeared normal. This conclusion was later substantiated by the fact that the paralysis disappeared during the patient's stay in the hospital. On the other hand, a number of patients escaped the scalpel. When a patient was admitted to the hospital, the results of the examination for nerve injury were recorded on a special mimeographed form and the patient's name was added to the list requiring surgical operation. Because the volume of nerve injuries was great, many patients were necessarily delayed two to four weeks before repair. The day before operation, the patient was re-examined and the findings checked with the original examination. When re-examined, 23 patients in all, had partially or completely recovered from the nerve injury which they had when admitted to the hospital.

There is no way at the present time to make this differential diagnosis between anatomical and physiological interruption. Great hope was placed in the electrical diagnostic methods that were developed before and during the war years, and definite progress has been made. Time is required in order to make comparative electrical examinations and I am of the opinion that when there is any doubt, the status of the lesion can be observed and electrically tested for a period of one month without jeopardizing the regenerative powers of the nerve if it has to be sutured at the end of this time.

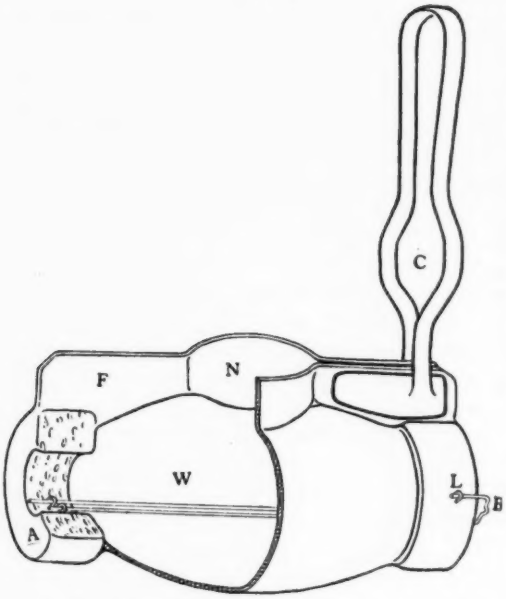
PROBLEMS OF NERVE REPAIR

It has been taught that, in order to give a nerve the optimum opportunity to regenerate, the repair should be done as soon as possible after the injury. This is known as a primary repair. The statistics of the first World War clearly indicated that, as each month elapsed between injury and repair, the chances for regeneration very rapidly became less. It was for this reason, when we began repairing nerve lesions, that we practiced primary suture. We discovered very shortly that it was almost impossible to differentiate between the normal and the damaged tissue in order to decide how much nerve tissue should be sacrificed. As the volume of work increased, it became necessary to delay repairs anywhere from two to five weeks from the time of injury. When the lesions were exposed at this time, it was a very simple matter to differentiate between normal and damaged tissue. For this reason, we purposely delayed surgery for an average of three weeks, feeling that the results would be much better and that regeneration would occur with greater certainty. Zachary and Holmes[1] have reported recently a series of patients in whom they had done delayed suture and had followed up for evidences of regeneration. Their results are very good and seem to indicate that this practice is justifiable since the results are equally as good if not better than primary suture. Thus, it would seem that we have proof to the effect that delayed suture is a sound principle and represents one of the advances in the management of these injuries.

It is generally accepted that end-to-end suture of the severed nerve stumps is the best type of repair. Because this method presents many problems—and also in an effort to overcome some of the factors which have inhibited regeneration—various changes in technique have been suggested and tried. Those which deserve consideration are the use of tantalum wire as a suture material, tantalum foil as a protective cuff about the suture site, and the plasma clot suture technique.

The ideal suture material is one which does not cause tissue reaction. Up to the time that steel wire was introduced, silk met these requirements, causing only slight reaction in the tissues. The one objection to silk is that if the wound becomes infected, all the sutures must be removed before healing will take place. Wire causes practically no tissue reaction and can be left in an infected wound. Tantalum, because of its malleability, was therefore introduced and has been used successfully. However, from a technical standpoint, since silk is so much easier to handle and causes negligible tissue reaction, I see no particular advantage in the use of tantalum. Wire does have one important use. It is opaque to the x-ray and, if placed on the sheath of the nerve as a marker, 1 cm. on either side of the suture line, one can tell from an x-ray film whether the suture line is holding by measuring the distance between the wire markers.

One reason for failure of nerves to regenerate after nerve repair is that scar tissue from the adjacent tissue grows in between the ends. In an effort to overcome this tendency, tantalum foil was placed around the suture site. What I am about to tell you has been learned from men who have had experience with the method, since I never used it. In patients who have had their repaired nerve encased in tantalum foil, and this foil removed many months after the repair, the nerve was found to be encased in a fibrous membrane which was, in many instances, choking the nerve. These findings have discouraged the use of this material and have prompted the removal of it from those in whom it had been used. Moreover, covering a sutured nerve with an inert substance, such as metal, seems to be contrary to physiological laws. Even though the physiologist tells us that the nerve axons receive their nourishment from their cells in the spinal cord or ganglia, as the case may be, he does not consider the various sheath cells of the distal portion of the nerve, which play a very important part in regeneration. Tarlov and Epstein[2] have shown that there is a very rapid vascularization around the suture line. Their work demon-



By Permission of: "Surgery, Gynecology and Obstetrics"

Sketch of latex mold used for plasma clot suture of nerves. W represents wire supporting rails which prevent sagging of the nerve ends. The rails (No. 34 nickel silver), which are removable, are threaded through wire loops in the base of the air-foam collar, A. The handle, B, of each rail is held in place by a wire loop, L. Metal clips, C, are applied to the fins, F, of the mold. The clips serve to tighten the grip of the air-foam collars and thus prevent retraction of the nerve as well as leakage of plasma. Plasma is introduced into the mold through the funnel, N. (From *I. An Experimental Study of Comparative Tissue Reaction,* by I. M. Tarlov, M.D., and Bernard Benjamin, M.D.).

strates the important part played by the local blood vessels in the reparative process.

THE method of plasma clot sutures was introduced as the answer to the objection of suturing nerves with foreign material. Medawar of England[3] and his co-workers began the method by using cockerel plasma clotted with chick embryo extract. The inconveniences involved in the preparation of these materials and, more particularly, the inflammatory and fibrotic reactions resulting in animals of other species led Tarlov and Benjamin[4] to use autologous plasma. The technique consists of preparing the nerve ends just as for end-to-end suture. Then the nerve ends are put in a special rubber mold so that they touch each other and are in perfect axial alignment. The specially prepared plasma is then poured into the mold and allowed to jell, which takes about ten minutes. When the mold is removed, there is a clear yellow clot all about the nerve ends holding them together. The appearance resembles the repair of a lead pipe. The nerve is allowed to drop back into the previously prepared bed and the wound is closed in the usual manner.

Dr. Tarlov was kind enough to supply me with the necessary molds and I employed the method in a number of patients. Our difficulty with the method was the preparation of the plasma, which had to be done at freezing temperature so that it would not jell before using. We overcame this difficulty by drawing the blood from the patient when we were ready to use it, placing it in a sterile, chilled centrifuge tube, spinning down the blood cells, and pipetting the serum into the mold as rapidly as possible. In most instances, the serum did not jell before it was introduced into the mold. Obviously the method requires a longer period of time than does end-to-end suture, but this is no objection, if the incident of nerve regeneration is higher than that for end-to-end suture. The proof of this must await a tabulation of results of a large series of cases.

I do not believe this method can be used in all cases. There are circumstances when there is not sufficient room to accommodate the mold or when the mold cannot be placed so that the plasma can be poured into it. Moreover, when nerve ends are brought together forcibly under tension, the technique is extremely difficult, sometimes impossible, and if accomplished, there is no assurance that they will stay together even if tension sutures are used.

Nerve grafting has been shown by various American and British workers to be unsatisfactory for guiding nerve axons across gaps in the nerve from the proximal to the periph-

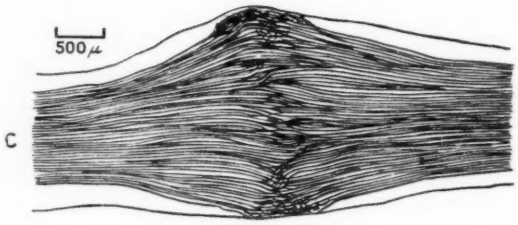
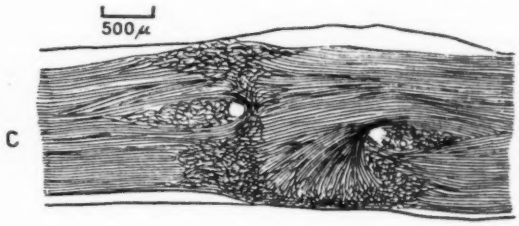


Figure 1. Right sciatic nerve of a rabbit. Junction made with plasma twenty-five days previously. The fibers have grown forwards with little deviation except at the edges. C, central stump.



From: "Lancet"

Figure 2. Left sciatic nerve of same rabbit as in Figure 1. Junction made with fine silk stitches. The stitches interrupt the outgrowth and the pressing together of the ends produces whorls and deviations of bundles. C, central stump.

eral stump. Many nerve injuries which confronted us during the war were so extensive that, in addition to the methods of freeing the nerve for a considerable distance along its course and rerouting and positioning the extremity, there often remained a gap between the ends which varied from two to six inches. The only means we had at our command of overcoming these gaps was by shortening the bone of the extremity or using nerve grafts. The former seems a rather radical procedure, but when considered in the light of the uncertain results obtained from nerve grafts which were known before this past war, it is not as radical as it sounds.

Nerves for the purpose of grafting have been taken either from the patient or from a fresh cadaver. In the case of the former, a sensory nerve was used, such as the anterior or lateral femoral cutaneous, the loss of which was not particularly important. Cadaver grafts were either implanted immediately or preserved by one of several methods before using. Some were preserved in alcohol, some in Ringer's solution, and some grafts were frozen. I preserved nerve grafts in plasma, storing them in a refrigerator, where ice cubes are ordinarily kept. I was able to observe only one patient for a period of seven months. At the end of six months, I re-explored the site of the graft, which was eight inches long, and found that the graft was in excellent condition; it felt and appeared normal; yet, a section removed from the cephalic end of the graft showed no histological evidence of regeneration.

In a recent article by Weiss and Taylor,[5] the repair of defects in nerves by the method of arterial tubes has been introduced with certain modifications. Weiss has done considerable work, studying the physiological characteristics of nerve regeneration. The principles developed from this study have been applied in animal experiments on rats and cats. Artificially made nerve gaps were bridged by a cylindrical blood clot sheathed by sleeves of artery or collagen tubing. Regeneration occurred in their animals for defects that were thirty times the diameter of the nerve. In another series of experiments they fastened a fiber glass cable firmly between the ends of the nerve. They encased this cable with blood clot and covered the entire preparation with a collagen tube. The nerve axons followed these fiber cables to the distal stump out to their terminal ends in the muscle, and gave clinical evidence of regeneration. This work requires clinical application before its true value can be estimated. The results they obtained, however, revitalize the interest in this method of nerve repair.

POSTOPERATIVE MANAGEMENT

There are three principles which must be carried out in the management of patients with nerve repairs to ensure them the maximum op-

portunity for complete recovery. They are: (1) keeping the paralyzed muscles, anesthetic skin areas, and joints in top condition; (2) preventing the overstretching of paralyzed muscles and the development of deformity; (3) sustaining the patient's morale and, incidentally, your own interest.

As a result of nerve paralysis, the muscles supplied by those nerves undergo atrophy, the affected joints may become ankylosed, and the anesthetic skin may undergo trophic changes. These changes must be prevented as far as is possible until the nerve supply has been restored. To accomplish this, these patients should be placed on a regular regime of physical therapy treatments. These consist of the use of dry or moist heat (the latter in the form of whirlpool) or both, and massage by a competent physical therapist. In the beginning, these treatments should be daily and later, as the patient becomes more active and has learned the care of the affected part, they may be given three times a week. Electrical treatments may also be employed, but great care must be exercised in their use because there is no better way to exhaust paralyzed muscles than by the incorrect use of electrotherapy. For this reason, a physical therapist who has had experience with electrotherapy should administer it. As power returns the patient is taught directional exercises, that is, specific exercises of the weak muscles, which are performed at regular intervals each day. As soon as the patient is capable, he is required to do that type of occupational therapy which will encourage the use of the involved muscles. During all this time the affected joints are kept freely movable by passive and active exercise. The anesthetic skin should at all times be kept clean, free from irritation, and protected from pressure and burning.

When it is necessary to maintain the extremity in a certain position to keep the suture line from pulling apart, a fixed cast is applied. Every two weeks this is removed and another applied in a more extended position so that, at the end of six to eight weeks, it is no longer necessary to wear this type of cast. A removable cast is then applied.

For the purpose of preventing paralyzed muscles from becoming overstretched, a factor which inhibits the return of function, the affected part of the extremity, as has been stated, is placed in a removable splint. Please do not consider this splint as similiar to that which is applied for the immobilization of fractures. It should be removed often, expecially during periods of activity. It must be removed when giving physical therapy treatments but must always be worn during sleep.

The regeneration of nerves takes anywhere from six months to two years, depending on the location of the injury in relation to the innervated muscles. This is a long time. The interest of the patient may wane and I have seen mild depression result, especially when the nerve is essential for a well-functioning hand and is vital to his livelihood. At the same time, the physician who is in charge of the patient may relax his vigilance over supervising the treatment. These factors, seemingly unimportant, are just as vital to the success of the repaired nerve as the surgery itself. Remember to keep a hopeful attitude while managing your patient and, under no circumstances, express doubt that the nerve will regenerate.

As a barometer for nerve regeneration, we have the physical signs of improvement in color and texture of the skin, the filling-out of the shrunken paralyzed muscles, the return of movement and sensation. In addition to these signs we have the assistance of electrical examination, which I mentioned when discussing the differential diagnosis of anatomical and physiological interruption. Electrodiagnosis has a distinct value in following the progress of nerve regeneration, because it will detect the reinnervation of the paralyzed muscles by the new motor neurons before the patient can voluntarily contract them. This examination should be made every month in every patient.

To go back for a minute—during the first World War, the use of galvanic and faradic currents as an aid in determining regeneration of nerves was definitely established,

and the reactions of the muscle at the motor point to this current was worked out for reinnervation. In an effort to simplify and create a more sensitive method chronaxia was introduced following the war. Chronaxia is the time it takes for a current, which is twice the minimal amount required to make a normal muscle twitch when applied to the motor point, to cause a reaction. This method seemed to have great promise. During World War II, however, it was not found as valuable as it was thought to be because the established motor threshold is not constant in all patients. Between the two wars many new electrical methods were introduced in connection with the study of neurophysiology in the laboratory, but were without clinical application, so that at the beginning of World War II we had at our disposal the two electrodiagnostic methods of galvanic-faradic stimulation and chronaxia. During the war several new methods were brought forth and applied clinically. Among these is an apparatus for the testing of skin resistance. It has been found that skin resistance is greatly increased when it has been deprived of its nerve supply and that this resistance will return to normal when reinnervated. This method permits a qualitative but not a quantitative estimation of the degree of sensory loss.

In an effort to improve the galvanic-faradic stimulation method, the trend has been to use an apparatus delivering a constant current or a constant voltage. Along the former principle, Pollock[6] and his co-workers introduced the method of progressive currents of long duration. The stimulating current was in the form of the sides of an isosceles triangle. They found that the further away from nerve innervation the more current is needed. They also found that if, when testing nerve lesions, there was a discontinuity in the curve—that is, instead of a smooth downward curve there was a break and a descent along a new plane—this indicated a favorable prognosis. This method has not received wide clinical application.

Ritchie of England,[7] by means of a special apparatus which delivers a rectangular electrical wave, has been able to detect regeneration before clinical evidence. His method seems to be a simple and practical one. He has shown that improvement in excitability appears a short time before the earliest sign is detectable by purely clinical means. He states that the distinction which the strength duration curve—that is, the curve obtained by this method—makes between normal and paralyzed muscle relates only to motor fiber degeneration. He also states that the technique does not differentiate between wallerian degeneration produced by traumatic or surgical division and that occurring as a result of severe protracted damage without actual anatomical nerve division; nor does it afford any account of the extent of motor power that may ultimately be recovered. In this respect, he states that you may get a response from the stimulation, yet there is no voluntary contraction. Others, as well as Ritchie, have recorded the observation that a sufficient number of innervated motor units may be present in a muscle to give a normal voltage curve, although that muscle may be incapable of active voluntary movement. Ritchie postulates that this may be due to the fact that the number of innervated motor units is large enough to produce a twitch on local stimulation but inadequate to give the ordinary movement or that their anatomical arrangement is such as to give the same effect. This method seems to have distinct advantages over others which have been tried and it deserves further clinical application.

Dr. F. H. Lewey of the Medical School at the University of Pennsylvania, and Dr. F. E. Nulsen have, at Cushing General Hospital, developed a method which may replace all present electrodiagnostic methods. Time alone will prove this fact. The simplicity of the method is to be seen in the equipment itself, which consists of two hypodermic needles, a rheostat, and an ordinary flashlight battery with some wire. The needles are introduced into the nerve at any point below the level of the lesion and the nerve is stimulated directly. Their results with

a series of some 3,000 examinations seem to indicate that the method is more sensitive and, consequently, of greater value than other methods because it gives direct information.

CAUSALGIA

There are two types of pain that occur in connection with peripheral nerve injuries. The first of these is that caused by irritation and has been referred to by some writers as minor causalgia. I object to the use of the word *causalgia* because, as described by S. Weir Mitchell, it relates to a particular clinical picture for which there is no known cause. The cause is irritation, in the pain to which I have referred, and it is probably initiated by the inflammatory reaction which takes place at the ends of the partially or completely severed nerve. In my experience, this type of pain has been relieved by repair of the nerve, or if not completely relieved, disappears four to six weeks afterwards.

The second type of pain is that of causalgia, which is an excruciating type of burning pain; the patient sits alone in agony, holding the cold, wet extremity rigid, covered with a cloth, because movement, noise, or a breath of air may increase the pain. The hand or the foot rapidly develops trophic disturbances and becomes "frozen" with contractures. The median and peroneal nerves are the most common ones associated with the pain, and the lesion of the nerve is usually insignificant. These nerves have the largest component of sympathetic nerve fibers and, for this reason, it was thought that they must play the major role in causing the pain. Dr. Norman Freeman, working in our hospital overseas, demonstrated that sympathetic injection of the upper thoracic ganglia for the upper extremity and of the second, third, and fourth lumbar ganglia for the lower extremity would relieve the pain of many of these patients. In those patients in whom the pain was temporarily relieved by injection, lasting relief was obtained by the removal of the appropriate ganglia.

The treatment of causalgia at the present time is a surgical exploration of the site of injury and correction of whatever may be at fault. After exploration of the nerve, the appropriate sympathetic ganglia should be injected with procaine. If this procedure gives relief, it is then justifiable to remove the sympathetic ganglia.

RESULTS

It was possible to follow only a few of the Chinese patients and this number, in comparison with the number of nerve repairs, is too small to attach significance to the results. The American patients were lost to us after their transfer back to the United States, but they have become a part of Army statistics.

No analysis of the results in a large series of Army or Navy patients has yet been made. The Army medical records contain a peripheral nerve registry of more than 7,000 cases. Elaborate plans are under way for the study of these patients, and the results are anxiously being awaited, for undoubtedly they will beneficially enhance the treatment of these injuries.

CONCLUSION

In conclusion, I wish to leave with you three thoughts: (1) Remember the diagnostic pin as the weapon for determining peripheral nerve injuries; (2) End-to-end suture remains the best method of repair and may be delayed two to three weeks after injury; (3) When these patients come under your care for postoperative management, maintain their interest and supervise their treatment meticulously, for the road to recovery is a long one.

REFERENCES

1. Zachary, K. B., and Holmes, W.: Surg., Gynec. & Obst. 82:632, 1946.
2. Tarlov, I. M., and Benjamin, B.: Surg., Gynec. & Obst. 76:366, 1943.
3. Young J. Z., and Medawar, P. B.: Fibrin Suture of Peripheral Nerves. Lancet 2:126, 1940.
4. Tarlov, I. M., and Epstein, J.: Nerve grafts: importance of adequate blood supply. J. Neurosurg. 2:49, 1945.
5. Weiss, P., and Taylor, C.: Guides for nerve regeneration across gaps. J. Neurosurg. 3:375, 1946.
6. Pollock, L. J., and others: Electrodiagnosis by progressive currents of long duration. Arch. Neurol. & Psychiat. 51:147, 1944; Surg. Gynec. & Obst. 79:133, 1944.
7. Ritchie, A. E.: The electrical diagnosis of peripheral nerve injury. Brain, 67:314, 1944.

New Developments in Surgery of the Heart

CLAUDE S. BECK*

WESTERN RESERVE UNIVERSITY SCHOOL OF MEDICINE, CLEVELAND

In this country cardiovascular diseases are responsible for one death out of every four. Coronary artery disease is responsible for one death out of every ten. Coronary artery disease kills almost as many people as does cancer. The coronary problem is quite as important as the cancer problem and should receive comparable experimental study.

In the past the usual approach to the study of cardiovascular disease has been indirect in its nature. As a rule the physician diagnoses cardiovascular lesions by the use of indirect methods. After this diagnosis of cardiovascular lesions has been made he usually treats them by the use of indirect methods. He uses the stethoscope, the cardiograph, the oxygen tent, digitalis, morphine, etc. Nowhere along the line does he deal directly with the heart and blood vessels. He does not see these structures; as a rule he does not do anything with them in a direct, manipulative way.

In recent years a change has taken place in the approach to the cardiovascular system. This change has been so gradual that perhaps you may not have noticed it. A beginning has been made to deal directly with cardiovascular diseases. The heart and blood vessels are being examined by direct vision and some of these conditions are being treated by direct surgical methods.

In reference to the heart and blood vessels we are in a developmental period similar to the developmental period of the central nervous system in the period of 1900 to 1910. During that period laminectomy and craniotomy were new operations. These operations made possible the cure of many neurological lesions, such as tumors, blood clots, etc. These operations were based upon the direct approach to the central nervous system. I believe a similar development is taking place now in reference to the heart and blood vessels. I anticipate that in the future surgeons will treat an increasing number of cardiovascular conditions by operation. I rather believe that methods will be developed to operate for conditions not only on the outside of these structures but on the inside of the heart and blood vessels as well. Methods for visualization inside blood vessels and the heart will be developed. Indeed, it may be possible in the future to keep the brain viable by a separate circulation while the heart

*Professor of Neurosurgery, Western Reserve University School of Medicine; Associate Surgeon, The University Hospitals, Cleveland, Ohio.

NOTE: Read before the meeting of the Interstate Postgraduate Medical Association of North America, Cleveland, Ohio, October 15 to 18, 1946.

is opened and operation done inside the heart. This will make possible the application of surgery to defects in the valves of the heart and blood vessels, defects in the auricular septum and in the ventricular septum, thrombi in the heart, tumor of the heart, etc.

I believe that the following cases are illustrative of this trend. One of these patients had an operation for patent ductus arteriosus. When this duct remains patent blood flows from the aorta into the pulmonary artery. The duct is beneath the second costal cartilage. Flow of blood through the duct produces a loud machinery type of murmur and also a thrill in this region. Blood is siphoned off the aorta, producing a low diastolic pressure and sometimes certain symptoms. Cyanosis is not one of these symptoms.

The treatment consists of ligation of this structure. The duct is exposed by incision over the second costal cartilage on the left. The dissection of the duct is not especially difficult. I ligate the structure with two ligatures of cotton tape. I do not believe it is necessary to cut across the duct and suture each end. I believe it is more difficult and more hazardous to do this. In a series of 16 cases that I ligated there was no mortality and no recurrence of the communication in any. These patients are cured. I believe that ligation should be done in every patient in whom the diagnosis of uncomplicated patent ductus can be made after the first three years of life. Because a patient with patent ductus arteriosus seems to get along without serious symptoms is not adequate reason for not doing the operation. There is almost no risk to the operation and the heart can be saved considerable wasted work by the ligation.

The next two cases illustrate compression of the heart. The first patient was admitted to the hospital three days before this paper was given. After admission my assistant removed 22 liters of fluid from the abdomen. This patient shows the clinical signs that enable you to make the diagnosis of compression of the heart. This triad of signs is a quiet heart, a high venous pressure in the arm, and ascites. You do not need anything more than this triad to make the diagnosis. Inspection of the precordium shows no cardiac pulsations. The heart is quiet. The venous pressure in the arm is 36 cm. of physiological solution of sodium chloride. We found that ascites begins to form when the venous pressure rises to about 18 to 20 cm. There is an operative scar over the precordium. This patient was operated upon in March 1946, and the patient states that he was not improved by the operation. Presumably the scar was not removed at all or it was incompletely removed. In order to cure this condition it is necessary to remove the scar well up over the auricles, aorta, pulmonary artery, and superior vena cava. If this is not done you may not get a cure. I believe we can cure this man by operation.

CLAUDE S. BECK

The third patient had acute compression of the heart in 1935 at the age of seven years. A collection of pus in the pericardial cavity produced acute compression. This diagnosis

can be made easily and accurately. He had a quiet heart, a high venous pressure in the arm, and a low arterial pressure. These signs are a diagnostic triad for acute compression of the heart. The boy was critically ill. The pus was evacuated and the boy was restored to good health. But the infection left some thickening of the pericardium. At first this pericardial scar tissue was inert but later on it underwent contracture, as does scar tissue anywhere in the body. The scar began to compress the heart. The heart did not have sufficient room to fill with blood. He developed the triad for chronic compression, which is now so easily recognized. The scar was removed ten years ago, and the cure has been complete. He is now taking a course in engineering.

The fourth patient had coronary artery disease. Two operations were done; the first was on the chest wall only. The precordial cartilages were removed and the pericardium was brought into contact with the soft precordium to which it was sutured. The heart was not exposed.

DR. BECK: Tell us first how sick were you before the first operation? How much could you do?

PATIENT: I could not do anything. I quit my job. I was given total disability by my insurance company. I had some pain over my heart and I had shortness of breath. I lost fifty-seven pounds in the course of two years.

DR. BECK: Was your condition changed after the first operation?

PATIENT: No, not until after the second operation was done.

DR. BECK: Your condition remained the same after the first operation. This is significant because it indicates that bed rest in the hospital did not improve his condition. At the second operation, done several weeks later, the pericardium was opened and some powdered silicate in the form of asbestos was introduced into the pericardial cavity. That operation was done in October 1942. Tell us how you got along after the second operation.

PATIENT: I left the hospital twenty-one days after operation and at that time I felt better. My pain was cured and I had no shortness of breath. I returned to work seven months after operation. I am a train dispatcher, and this work carries great responsibility and is extremely nerve-wracking.

DR. BECK: Have you been able to carry on your work?

PATIENT: I've worked every day, seven days a week, except for a few short vacations. So far this year I have worked every day except twenty-two days, most of which were Sundays.

DR. BECK: Do you have any pain?

PATIENT: None.

DR. BECK: Do you think you are well?

PATIENT: I do, definitely.

Improvement in this case was based upon the establishment of new blood vessels in the heart. These vessels are between pericardium and chest wall and heart. They also are between the coronary arteries themselves. These intercoronary communications are important in preventing death. As occlusion develops in one vessel it is well to have other channels coming in to supply every part of the heart muscle.

These patients briefly illustrate the direct approach to the treatment and cure of certain types of cardiovascular disease. They illustrate what can be done by the direct surgical approach in treatment. They point the way to the future when an increasing number of these conditions will be treated by surgical operation.

The Care and Mobilization of the Paraplegic

OLIVER S. WAUGH*

UNIVERSITY OF MANITOBA SCHOOL OF MEDICINE, WINNIPEG, MANITOBA, CANADA

PARAPLEGIA resulting from gun shot wounds of the spine is one of the tragedies of modern warfare. Few paraplegic casualties in World War I survived over an extended period of time. After suffering such complications as bedsores, mass reflex spasms, and contractures, they usually succumbed to genito-urinary infection within a few months. In civilian practice one sees these cases only occasionally as the result of disease or injury.

During 1945 some 200 service paraplegics were distributed to four neurosurgical centers across Canada. Forty-three of these have been under treatment at Deer Lodge Veterans' Hospital, Winnipeg. It soon became apparent that their successful management presented a complex problem involving the prevention and control of potential complications, particularly genito-urinary infection.

Within the last ten years renewed interest has been aroused in the handling of these cases, stimulated largely by the results obtained by Munro[1, 2] of Boston. He pointed out that prolongation of life alone with a vegetative existence in bed is not sufficient: that with proper management the paraplegic can be advanced to wheel-chair life, and in many cases, to brace-walking on crutches. Many can be trained in some sedentary and gainful occupation. In this way they are encouraged to overcome their sense of inferiority and their dependence on those about them.

*Professor of Surgery, Director of the Department of Surgery, University of Manitoba School of Medicine, Winnipeg, Manitoba, Canada.

NOTE: Read before the meeting of the Interstate Postgradute Medical Association of North America, Cleveland, Ohio, October 15 to 18, 1946.

IMMEDIATE TREATMENT

First aid treatment of spinal injuries with paralysis is extremely important. In war casualties many cases suffered associated injuries, more or less serious, of the chest or the abdomen. Such complications are seldom seen in civilian cases. Unless associated with a head injury, there is no loss of consciousness.

In moving the traumatic paraplegic at the time of injury, it is essential to avoid increasing the damage to the spinal cord or cauda equina. Four assistants are required—one each at head and feet, and two for the body—so that extension can be maintained, and the patient moved as "in one piece." On no account must the spine be flexed, rotated, or over-extended at the site of injury. It is preferable to transport the patient on his back, care being

taken to avoid pressure on insensitive skin areas by wrinkled clothing, blankets, or other objects. Pressure sores develop so rapidly and so frequently, every preventive measure should be taken from the beginning. In cervical injuries, the head should be steadied by a pack on either side, and a small pad should be placed under the shoulders to increase local extension slightly. The calves should be supported to relieve pressure on the heels.

When the patient reaches the hospital, he is placed on an inner-spring mattress, and his position is changed frequently—every two hours—during the day and night. In the lateral position, the lowermost knee should be flexed, brought forward, and separated from its fellow by a pillow. In the dorsal position, the calves are supported on pillows, and the feet dorsiflexed to right angles by a padded board across the foot of the bed. A cradle keeps the pressure of bedclothes off the feet.

OLVER S. WAUGH

CARE OF THE BLADDER AND BOWEL

As well as immediate flaccid paralysis of the lower extremities, there is also flaccid paralysis of the bladder and bowel. Early care of the bladder is of the utmost importance. Urinary sepsis may prove fatal, or it may result in the formation of disabling complications such as urinary calculi. Rational management of the cord bladder requires an appreciation of normal bladder physiology and is based on certain fundamental principles.

Normal micturition is a voluntary reflex act, governed by both efferent and afferent impulses, with the reflex arc centering in sacral segments 2, 3, and 4 at the level of the first lumbar vertebra. This area is termed the bladder center or nucleus. Spinal cord injury above the level of the first lumbar vertebra is spoken of as a supranuclear lesion. Such an injury leaves the reflex arc of the bladder intact but without cerebral control. With proper management during this period of spinal shock, these cases will develop within a few months a reflex automatic bladder.[1] Such a bladder should have a capacity of 250 cc. to 300 cc. and empty automatically, every two to three hours, leaving little or no residual urine. In the intervals, there is no dribbling and the patient is comfortable.

In lesions of the cauda equina at or below the level of the first lumbar vertebra, the bladder reflex arc is abolished—reflex automatic evacuation of the bladder cannot occur. In some cases partial evacuation of the bladder may be accomplished. This is commonly spoken of as "the autonomous bladder."[1] A transurethral resection of the internal sphincter in a few cases has been of some value. Permanent suprapubic drainage was considered necessary in two of our cases.

The circumstances surrounding cases of spinal cord injuries in the field with their long trip to the base hospitals in Britain and later to Canada made some method of immediate bladder drainage necessary. Intermittent catheterization was undesirable as it resulted in urethral trauma and infection. It was agreed that high suprapubic cystotomy done early was the method of choice. All our overseas cases arrived with suprapubic cystotomies, and had

more or less mixed infections of the bladder. All cases who were injured in Canada came into the hospital with urethral catheter drainage, and in not a single instance was a cystotomy performed.

In the urological care of these patients, two systems of irrigation have been used: (1) a closed system of irrigation and drainage, used as a preliminary form of treatment in all cases on arrival in hospital; and (2) tidal irrigation, with cystometric control. This implies automatic filling and emptying of the bladder at a predetermined level of intravesical pressure, ascertained by cystometric examination. This constitutes an attempt to simulate normal bladder activity. "G" solution[3] is used in cases where bladder sepsis is pronounced, while half-strength "G" solution is considered satisfactory when the urine becomes clear. This system is kept up until the optimum pattern of bladder activity is obtained. For a complete transverse lesion above the bladder nucleus in the spinal cord, the optimum pattern is a reflex automatic bladder; for a destructive lesion in the cauda equina or conus, an autonomous bladder; for a partial lesion anywhere in the cord, normal bladder activity.

Tidal irrigation has been routinely employed by Dr. D. Swartz[3] of the Urological Service of Deer Lodge Veterans' Hospital with very gratifying results. The main advantages in this form of treatment are the minimizing of urinary infection, the maintenance of normal bladder capacity, and prevention of "the contracted bladder." Tidal irrigation will function through a suprapubic as well as a urethral catheter and has been used in all of our cases.

Fluid intake is forced to between 3,000 cc. and 4000 cc. daily. If this amount is difficult by mouth, intravenous fluids may be given. An attempt is made to maintain a urinary *p*H of 5.5 or less. Dilute hydrochloric acid is given by mouth to facilitate this.

When automatic function is indicated by cystometric examination, the suprapubic tube is removed, and a No. 16 Foley urethral catheter maintained in situ until the fistula has closed. Only one fistula in our entire series had to be closed by operation.

The reflex automatic bladder empties every two to three hours, with little or no warning. By careful attention, the patient soon learns to anticipate and prepare for this evacuation so that he is not inconvenienced by it. When he intends to be away from the hospital for more than a few hours, a rubber urinal is usually worn. Frequent x-ray examinations of the kidneys and bladder are advisable, together with routine intravenous pyelography. As in other patients who are kept at rest in bed for long periods, particularly if urinary sepsis has occurred, calculi may form and necessitate surgical removal.

Emphasis has been placed on the care of the bladder because the life of these patients depends on keeping the urinary tract free of sepsis. Teamwork on the part of the surgeon, nurses, and orderlies is most important in the successful maintenance of tidal irrigation.

Management of the paralyzed bowel is essential to the mental and physical welfare of these patients. Enemata given every two days are usually effective. When the patient is able to leave the bed, they can be self-administered on a toilet. Bowel evacuation can be assisted by regularity of habit. An intelligent patient learns to use the milder laxatives successfully.

COMPLICATIONS

An early and frequent complication in paraplegia is bedsores. They may occur over any insensitive bony prominence subject to pressure, notably over the sacrum, anterior superior spines, trochanters, and heels. They are best avoided by frequent changes of position. The paraplegic should have his position changed every two hours, day and night, as long as he is bedridden. This is prophylactic against urinary calculi as well as bedsores. Careful and frequent skin cleansing is essential. Maceration and bedsores quickly follow any prolonged exposure of the insensitive skin to moisture. Plaster casts should not be used unless absolutely

necessary for other complicating injuries.

In the early stages bedsores should be kept dry and clean. As the slough separates, mild antiseptic ointments such as 5 per cent sulfadiazine are useful. It is important to administer a high protein–high vitamin diet, as the continued loss of fluid may result in hypoproteinemia. Blood or plasma transfusions may be required to maintain normal serum protein level—a necessity for the healing process. In many cases surgical closure by plastic methods will save months of healing and breaking down.

Twenty-four of our cases had bedsores at one time or another. Nine of these were successfully closed by plastic surgery; 3 are still active, and the remainder healed spontaneously with no complications.

ANOTHER troublesome complication is mass reflex spasms which may occur within a few weeks after a spinal injury with a complete cord lesion. Flexor spasms of the legs, thighs, and, finally, of the abdominal muscles may result from the slightest stimulus, such as moving the bedclothes, touching the skin, or even a cold draft. In pronounced cases this spasm may be accompanied by evacuation of the bladder. Such contractions prevent the patient from becoming ambulant or even using a wheel-chair. Urination becomes unpredictable and uncontrollable. As pointed out by Munro[1] the "mass reflex spasm" can be abolished by intraspinal bilateral anterior rhizotomy, i.e., sectioning the anterior roots from D.10 to S.1 inclusive. This operation produces total permanent flaccidity of the legs and should only be undertaken when the mass reflex is active and disabling. Spasms developed to some extent in 6 of our cases. In some cases they were present only in a minor degree and did not materially interfere with ambulation. Three cases required anterior rhizotomy. Reflex spasms were satisfactorily controlled in 2 of these; in the third, a disabling amount of spasm recurred a few weeks after the operation. Posterior rhizotomy of D.10 to S.1 was then performed and effectively produced complete flaccidity. Possibly, posterior rhizotomy is the operation of choice; it is much the easier to perform.

OPERATION

A decision that must be made in the early treatment of closed injuries of the spinal cord with paralysis is whether operation on the spine is indicated. There is some controversy on this point. The majority opinion favors laminectomy if spinal canal block can be demonstrated. Open reduction and fixation of deformity may be indicated. In partial lesions laminectomy offers some hope of improvement. On the other hand, it might be argued that a patient who recovers after early operation might have recovered spontaneously. If paralysis is immediate and complete, the results of operation are not encouraging. To be effective, surgical interference should be carried out within the first forty-eight hours after injury. In cervical lesions with respiratory embarrassment, surgical procedures are dangerous, but they may be indicated for the reduction of deformity if spinal block is present.

Pain is a feature of most lesions of the cauda equina; if it is severe, laminectomy with decompression of the nerve roots may give relief. Botterell *et al.*[4] and Elkins and Wegner[5] report satisfactory relief in some cases following section of the spinothalamic tract. Root pain from higher levels, if severe, may require exploratory laminectomy. Some of these cases are the result of direct root compression from scar tissue or bone fragments. Laminectomy with section of the involved posterior roots frequently relieves the condition. Although pain has been present in some of our cases, it has tended to subside as the general physical and mental welfare of the patient improved. No surgical procedure for pain has been necessary.

PHYSICAL TRAINING

Physical training of the paraplegic begins while he is confined to bed. When the urinary tract is free of sepsis, the bladder automatic,

and the patient free of other potential complications, he is initiated into wheel-chair life. Any patient who is intelligent and cooperative and has the use of his shoulders, arms, and hands can be made ambulatory. All cases are supplied with a collapsible wheel-chair (the Everest and Jennings Universal Model wheel-chair—weight, 44 pounds) and soon learn to get from bed to chair and back again without assistance. When the patient wishes to leave the hospital, the chair is folded and accompanies him, in the back seat or rear compartment of the car.

After adequate physiotherapy which is designed to strengthen the functioning muscles, many paraplegics can be taught to walk with the aid of crutches and leg braces. The leg brace used at Deer Lodge Hospital was developed by the Department of Veterans' Affairs at Christie Street Hospital in Toronto with the cooperation of the other neurosurgical centers of the department. It consists of a leg brace with a drop-foot ankle lock and a knee lock. The latter can be easily released by tripping a bar across the back of the joint. In some cases, it is desirable to supply a pelvic brace with a joint at the hip and a check to prevent overextension. This is attached to the leg braces and is dispensed with after a few weeks.

Two types of gait are commonly used: (1) the four-point gait, in which the patient first transfers his weight in sequence to first one crutch, then one foot; then repeats by advancing the other crutch, and the other foot; and (2) the swing-through gait, in which the crutches are advanced, and, bearing his weight on them, the patient swings his lower extremities through, to place the feet in advance of the crutches. The latter gait is speedier but is more tiring and more difficult to control than the four-point gait. Patients are taught both types and use whichever they prefer.

One of the major difficulties of the paraplegic in brace-walking is the lack of sensory contact with the ground. However, with practice, he becomes expert at balancing, overcoming small obstacles, mounting curbs, and even going up and down stairs. Such maneuvers demand good physical condition of the arm and shoulder muscles. Patients are carefully trained to fit them for this strenuous life by various types of mat exercises, physiotherapy, and games, such as bowling, swimming, archery, etc.

STATISTICS

Of the 43 cases treated at Deer Lodge Hospital, 27 had complete cord lesions, and 16 had incomplete cord lesions.

TABLE 1

SPINAL CORD INJURIES

Type	Complete	Incomplete	Total
Cervical	2		2
Thoracic	24	10	34
Cauda equina	1	6	7
Total	27	16	43

Two cases had complete lower cervical lesions with only partial use of their hands and arms; they are limited to a wheel-chair life. Seven cases had lesions of the cauda equina—6 incomplete, 1 complete. There have been 3 deaths: one from metastatic carcinoma of the prostate, the second from chronic glomerulonephritis and pyonephritis of long standing, and the third from empyema and meningitis. One patient developed pulmonary tuberculosis and died in a sanatorium.

Fourteen of the incomplete lesions have some degree of voluntary bladder control. Twenty-three of the complete lesions have reflex automatic bladders, and 3 cases have autonomous bladders. Ten of our cases developed urinary calculi, but in many of these the nuclei were present on arrival from overseas.

All patients have been home at one time or another. At the present time 14 patients are living at home. Ten of these are employed in gainful occupations, as follows: railway clerk, insurance salesman, leather piece work, jewelry shop and watch repair, department store salesman, clerk in liquor commission, shoe repairer, watch repairer, secretarial work, and clerk in

an oil company. Apart from the difficulty in finding living accommodations, it is anticipated that all but 6 of the total of 43 paraplegics will have been discharged from the hospital by the autumn of 1947. It is doubtful whether all of these will be able to remain out of the hospital for an indefinite period at first. Sixteen paraplegics have applied for, and are obtaining, their own homes in Winnipeg, under the Wartime Housing Scheme. Fourteen complete paraplegic cases now own and drive their own automobiles.

TABLE 2

REHABILITATION RESULTS

	Complete Paralysis	Incomplete Paralysis	Total
Wheel chair	5	..	5
Walking with braces	20	7	27
Walking without braces	..	7	7
Total	25	14	39
At Work	8	5	13

Several patients were married before they were injured. So far, their homes have survived. One of our patients was recently married after frank discussion and explanation of the impossibility of sexual life in the complete paraplegic.

CONCLUSION

The successful management of the paraplegic patient depends upon the cooperation and teamwork of a highly trained staff and personnel. The most important of these is the urologist. He must exercise constant supervision over the urinary tract during the lifetime of the patient. All attendants must show a sympathetic understanding of the psychological disturbances associated with this type of injury, where the patient, with the best of care, is doomed to a great amount of permanent disability. The Canadian Department of Veterans' Affairs has created centers for the care of war service paraplegics and has recently extended these facilities to civilians, for a consideration. Arrangements have been made for adequate follow-up and every patient upon discharge is instructed to return for periodic checkup and further treatment if necessary. The work of this department is not the work of one man, but of a group of men and women who have pooled their efforts. It is felt that by this system, the optimum results can be obtained.

REFERENCES

1. Munro, Donald: New Eng. J. Med. 215:766, 1936.
2. *Ibid.*, 233:453, 1945.
3. Swartz, D.: Canad. M. A. J. 54:333, 1946.
4. Botterell, *et al.*: Canad. M. A. J. 55:249, 1946.
5. Elkin, C. W., and Wegner, W. R.: Ann. Surg. 123:516, 1946.

Malignant Lesions of the Right Colon

WITH PARTICULAR REFERENCE TO ONE-STAGE RESECTION

CHARLES W. MAYO*

UNIVERSITY OF MINNESOTA GRADUATE SCHOOL OF MEDICINE, ROCHESTER, MINN.

THE RIGHT portion of the colon means one thing to one person and another thing to other persons. In past studies I have included the cecum, ascending colon, and hepatic flexure in my consideration of the right portion of the colon. Some writers include the cecum and ascending colon only, and others also include the hepatic flexure and the first half of the transverse colon. It is important for a reader or listener to evaluate the presentation on an anatomic basis.

In this consideration, the cecum, ascending colon, and hepatic flexure make up the right portion of the colon. However, if a lesion of the hepatic flexure also involves a small proximal portion of the transverse colon, it has been included in this consideration of lesions of the right portion of the colon. The transverse colon is considered a separate anatomic entity, from a surgical standpoint, if a growth situated therein does not involve the hepatic or splenic flexures of the colon.

In a study which Lovelace and I made of cases of malignant lesions of the colon seen at the Mayo Clinic between 1907 and 1938, inclusive, it was found that 30 per cent of the growths involved the right portion of the colon. When malignant lesions of the abdominal portion of the colon, the rectosigmoid and rectum are considered, approximately 12 per cent occur in the right portion of the colon.

*Surgical Section, Mayo Clinic: Associate Professor of Surgery, University of Minnesota Graduate School of Medicine, Rochester, Minnesota.

NOTE: Read before the meeting of the Interstate Postgradute Medical Association of North America, Cleveland, Ohio, October 15 to 18, 1946.

SEX AND AGE

There is a higher incidence of malignant lesions of the right portion of the colon in males than in females. In 885 cases, about 62 per cent of the patients were males and 38 per cent were females. In general, the patients were in the so-called cancer age; the average age of the patients was fifty-five years. Only 2.3 per cent of the patients were less than thirty years of age.

DIAGNOSIS

Inasmuch as physicians who have analyzed the subject have found that from 10 to 15 per cent of patients who have carcinoma of the right portion of the colon have undergone only appendectomy within the duration of the symptoms of the malignant process, it is important in cases of suspected appendicitis, particularly in

cases in which the patients are more than thirty years of age, to make an incision that will permit exploration of the right portion of the colon.

Once a malignant lesion has its inception in the right half of the colon or, for that matter, anywhere in the body, it eventually causes subjective symptoms and signs. Unfortunately, in the section of the colon under consideration, the early evidences of malignant change are so masked and indefinite that a person who has a lesion of this nature is unaware of it and the progress of the disease process is so insidious that the increasing discomfort is attributed to natural or unnatural indiscretions of diet or to age itself. In more than 40 per cent of such cases, close questioning of the patient will elicit the information that signs and symptoms of the disease have been present for a year or longer.

Intestinal obstruction is not a common finding, but abdominal discomfort, weakness, and fatigability are common symptoms. Although a change in bowel habits alone may be an unreliable sign, it should be sufficient reason for the physician to make a roentgenologic examination of the colon and repeated examinations of the stool for occult blood, which may be found in as many as 75 per cent of the cases. A mass of varying size can be palpated in the right lower or upper quadrant of the abdomen in 75 per cent of the cases.

When anemia is found in the course of a routine examination or if a patient has been told that he has pernicious anemia and the presence of this disease is considered doubtful, the presence of a malignant lesion of the right half of the colon should be considered. At least, it should be ruled out by adequate examination. An operable lesion of this type which has not metastasized to the liver or to the lymph nodes can cause severe anemia as a result of prolonged oozing from an extensive, raw, ulcerated surface.

CHARLES W. MAYO

Let us assume now that the patient has had sufficient indications of trouble to consult a good physician and that the physician has taken a careful history, has made a thorough examination, and has found a malignant lesion of the right portion of the colon. What is the next step? From this point, no time should be lost in preparing the patient for proper surgical treatment. This lesion constitutes an emergency! The preparation of the patient for operation is the first opportunity for the physician to save time; the next opportunity is in the selection by the surgeon of the type of operation for the patient. The change which will determine whether cure or only palliation is possible will take place at some instant of some minute of some hour. The physician can only hope that the time when cure is possible has not already passed.

PREPARATION FOR OPERATION

In any instance in which operation on the colon or rectum is contemplated, a regimen of preparation is imperative if optimal results are to be obtained. The methods of cleansing the bowel and approaching the objective of eliminating harmful bacteria from the lumen have varied with time. The present routine, which

may be varied for individual patients, requires hospitalization for three to five days before operation. During this period, the following measures should be employed. The patient should be given a nonresidue diet that is rich in proteins, carbohydrates, and vitamins. Sodium phosphate should be administered as a laxative. Twice a day, the colon should be irrigated. Sixty grains (4 gm.) of succinyl sulfathiazole or sulfathalidine (phthalylsulfathiazole) should be administered every four hours until six doses have been given. Thereafter, 2 gm. of the drug should be administered every four hours until the time of operation. If this plan is followed, a total dose of at least 720 gr. (48 gm.) will be administered in seventy-two hours. One milligram of vitamin K should be administered daily. The patient's blood group should be determined before the operation. Three doses of camphorated tincture of opium, each consisting of 8 cc., should be administered during the afternoon and evening before the operation.

It is obvious that no type of routine treatment will be applicable if obstruction is present. However, severe obstruction occurs in few cases of malignant lesions of the right portion of the colon, because of the fluid nature of the fecal content, the size of the intestinal lumen, and the anatomy of the wall of this portion of the colon.

For some years prior to the war, some surgeons who were interested in surgery of the colon were advocates of the intraperitoneal use of antiperitonitis vaccine. Prior to the introduction of succinyl sulfathiazole and similar drugs and the establishment of their efficacy in preparing the colon for operation, the intraperitoneal use of the antiperitonitis vaccine was valuable; now, it is unnecessary, in my opinion. The results obtained by the present preoperative regimen are the best testimony to the value of the proper use of succinyl sulfathiazole and sulfathalidine. These drugs tend to produce a smooth convalescence and to lower the mortality.

It is needless, I am sure, to warn that, despite the present excellence of preoperative preparation, there is neither a drug panacea nor a substitute for surgical judgment as to whether or not to operate, when to operate, and the selection and performance of the operation itself.

ANESTHESIA

The best anesthetic to use is the one with which the anesthetist is most familiar. However, it does not follow that the one used is always the best one for the individual patient. Great advances have been made in anesthesia. It is an ever-changing and developing field. Since I have returned from military service, I have used spinal anesthesia less frequently than formerly and I have used inhalation anesthesia more frequently. Curare occasionally has been combined with anesthetic agents. What a surgeon means when he expresses his preference for one type of anesthesia is simply that he finds it best at that given time, in the circumstances under which he happens to be working. Next year or the year after, he may have a new preference.

SURGICAL PROCEDURES

The following operations may be used in the treatment of malignant lesions of the right side of the colon.

1. Primary resection can be accomplished as a one-stage operation; that is, by resection and primary ileotransverse colostomy.
   a. Side-to-side anastomosis of terminal portion of ileum to transverse colon.
   b. End-to-side anastomosis (end of ileum to side of transverse colon).
   c. End-to-end anastomosis (ileum to transverse colon).
2. Primary resection can be accomplished, but multiple stages are required for completion of operation.
   a. Mikulicz's operation, that is, extraperitoneal resection, or a modification of this operation; for example, the Lahey operation may be used. These procedures may or may not be combined with ileocolostomy at the first stage. Regardless of whether ileocolostomy is performed, the ileum and transverse colon have to be closed or joined at a later date.

3. Two-stage resection.
   a. Ileocolostomy performed as an end-to-side or side-to-side anastomosis with or without transection of the ileum between the site of the ileocolostomy and ileocecal valve.
   b. Resection performed with one of the following procedures.
      (1) Closure of the divided ends of ileum and colon after a side-to-side anastomosis has been carried out in the first stage.
      (2) End-to-end anastomosis of divided ends of ileum and colon after primary side-to-side anastomosis.
      (3) Closure of the end of the colon if an end-to-side anastomosis has been carried out in the first stage.

No matter what method of surgical approach may be selected by the surgeon familiar with this field of surgery, the last decade has seen a lowering of hospital mortality. There are proponents of all the operations that have been mentioned and they all have good and sufficient reasons for their support of a particular method.

A word must be said about ileostomy, which in the past was considered by some surgeons to be a safety procedure to use with one-stage resection. Actually, ileostomy is a hazard and increases hospital mortality 6 per cent, attested to by a review of cases in which operation was performed at the Mayo Clinic up to 1938. I have yet to see a case of malignant disease of the right portion of the colon in which ileostomy was indicated.

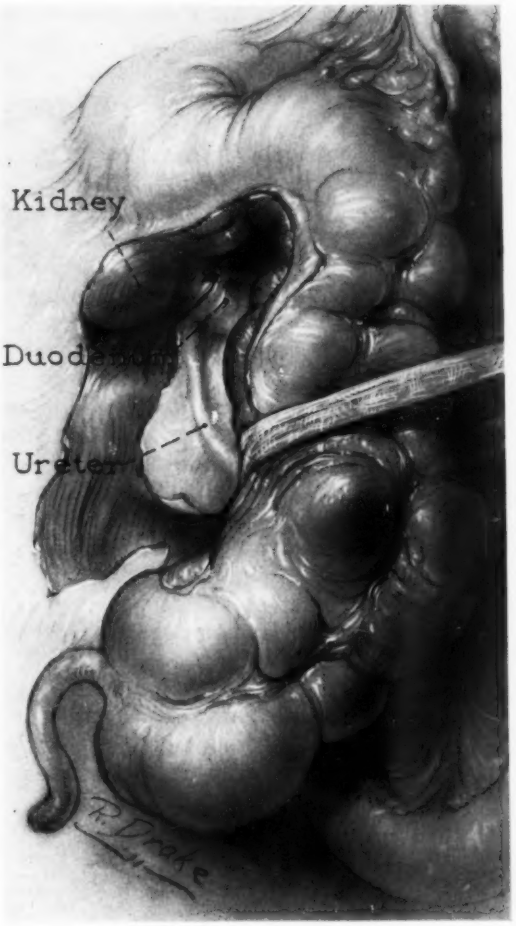


Figure 1. Mobilization of right portion of the colon.

At one time or another, I have performed every operation described for dealing with neoplastic lesions of the right portion of the colon and I have arrived at certain evaluations of these operations.

In the past sixteen years, I have not seen a malignant lesion in the right portion of the colon that could not be resected at the primary operation, if it was resectable at all. During this period, the only times I have participated in the performance of resection in two stages have been in cases in which patients who were assigned to my service previously had undergone ileotransverse colostomy.

Primary resection best satisfies the factor of time as related to the spread of the malignant process by contiguity, by the lymph vessels, and by blood vessels. This is axiomatic. It can be as radical as any two-stage operation.

The hospital mortality rate for primary resection with immediate anastomosis (side-to-side anastomosis with closure of the ends of the

ileum and transverse colon; end-to-side anastomosis with closure of the end of the colon; end-to-end anastomosis of the ileum to the transverse colon) is lower than that for the two-stage operation with secondary resection.

In support of the last statement, I shall mention a review of 486 cases of malignant lesions of the right portion of the colon in which operation was performed at the clinic in a period of six years—namely, January 1, 1940, to December 31, 1945. Of the 486 patients, 262 underwent a primary one-stage resection. In 78 cases, ileocolostomy was performed with the idea of performing a second-stage operation later; in 62 cases, the operation was completed; in 16 cases, only the first stage of the operation was carried out. In 41 cases, extraperitoneal (Mikulicz) resection was performed; in 8 cases, local excision was carried out; in 20 cases, abdominal exploration only was possible; and in 77 cases, palliative ileocolostomy was performed.

The hospital mortality rate for one-stage resection and primary anastomosis was 3.8 per cent, as compared with 15.3 per cent for the two-stage operation. The mortality rate for extraperitoneal resection was 9.8 per cent.

The primary resection and anastomosis that I favor is that which is performed by end-to-end ileotransverse colostomy. Up to October 1946, I had performed this particular procedure in 51 cases of neoplasm of the right portion of the colon with only one hospital death, that of a man aged eighty-two years.

THE pertinent points of primary resection with end-to-end ileocolostomy and the immediate postoperative care, as carried out on my service, are as follows:

1. An incision is made near the outer border of the right rectus muscle and the muscle is retracted medially.

2. The contents of the abdomen, especially the liver, gallbladder, and right portion of the colon, are explored.

3. The transverse colon is transected with the cold knife at some point within its first third.

4. The ileum is transected at an angle to insure a good blood supply to the cut edge and an adequate lumen.

5. An open type of anastomosis is performed over rubber-covered clamps. A continuous suture of fine catgut is used in the mucosa; a continuous suture of cotton is used in half the serosa and an interrupted suture in the other half. (Figures 1 and 2).

6. Retroperitoneal drainage is established and maintained for a week to ten days.

7. Raw surfaces should be covered with peritoneum.

8. At least 5 gm. of powdered sulfanilamide is placed in the peritoneal cavity.

9. The abdominal incision is closed by approximating the peritoneum and the posterior fascia with a continuous suture. The anterior fascia is closed with interrupted sutures.

10. The anus should be dilated manually so as to produce partial paralysis of the sphincters for several days.

11. Five hundred cubic centimeters of blood should be transfused during the surgical procedure. If there is a question as to the need for more blood, it is an indication for more.

12. A Miller-Abbott tube was not used and did not seem to be indicated, either preoperatively or postoperatively, in this series of 51 cases.

13. Concentrated oxygen should be administered postoperatively by Boothby-Lovelace-Bulbulian mask.

14. Fluid balance should be watched closely and maintained by the administration of 2,000 to 3,000 cc. of 5 per cent solution of dextrose in distilled water. Sodium chloride is administered according to the individual needs of the patient.

15. Administration of fluids is started by mouth as soon as flatus is passed, usually on the third day.

MORBIDITY

The morbidity, as indicated by days of hospitalization, is better by approximately two-thirds for one-stage resection with end-to-end ileotransverse colostomy than for the two-stage resection.

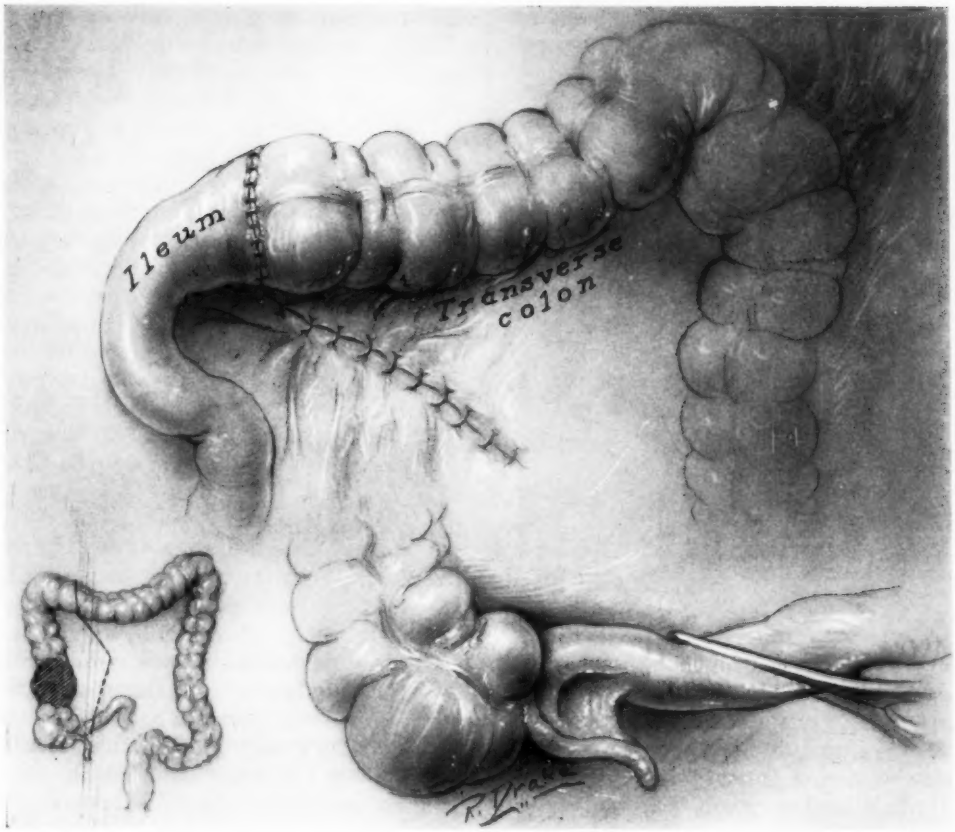


Figure 2. End-to-end anastomosis between ileum and transverse colon.

SUMMARY

In my studies of the right portion of the colon only the cecum, ascending colon and hepatic flexure are included. Roentgenologic examination of the colon should be made in those cases in which indefinite abdominal distress is accompanied by weakness, fatigability, and often anemia, particularly when an abnormality of the stomach and gallbladder has been ruled out. A one-stage primary resection best satisfies the factor of time, as related to malignant disease and metastasis, and end-to-end ileotransverse colostomy is recommended as the best operation for the anatomic reconstruction of continuity of the bowel. Only one hospital death occurred in a consecutive series of 51 cases in which primary resection and end-to-end anastomosis were performed for malignant lesions of the right side of the colon.

DIAGNOSTIC CLINIC

Management of Hypertension

IRVINE H. PAGE, A. C. CORCORAN, AND R. D. TAYLOR

THE CLEVELAND CLINIC, CLEVELAND

I. CLASSIFICATION OF HYPERTENSION

IRVINE H. PAGE, M. D.

I HAVE the somewhat unhappy job of trying to tell you about the classification of hypertension. This really is not much fun, for the simple reason that to inject any new ideas into the classification of patients with hypertension is difficult. What I am going to attempt is an experiment to see if I can correlate the investigations on the mechanism of hypertension with the patient himself, to see if we don't end up with the finding that the patient with hypertension is really a mosaic in which the various endocrine, central nervous, and humoral systems combine to make up a disease picture. I think that way you will find hypertension a much more interesting subject than if it is considered a condition in which the blood pressure alone is elevated.

As you are well aware, there are many known causes of hypertension, or, to put it another way, there are a number of diseases with which hypertension is associated. I think if you will consider the mechanisms of the rise in blood pressure in these patients, you will see that ultimately they may be applicable to patients with essential hypertension. I shall try and divide patients with essential hypertension into various groupings according to the predominant system involved.

Some of these ideas are rather tenuous and need a good deal more study than they have had. For example, if we say that hypertension might be due directly to hyperactivity of the central nervous system, then new work in Minneapolis on the association of hypertension with bulbar poliomyelitis is pertinent. The interesting finding has turned up that many children with the bulbar type of poliomyelitis develop hypertension. It would seem that these are examples of hypertension in which the nervous system is directly involved.

There are experimental counterparts to this, as in the famous Cushing experiment in which the cerebrospinal fluid pressure is elevated ex-

NOTE: Presented before the meeting of the Interstate Postgraduate Medical Association of North America, Cleveland, Ohio, October 15 to 18, 1946.

perimentally. When this is done, the blood pressure rises. There are other examples as well, besides increased intracranial pressure, such as sclerosis of the carotid sinus. This, of course, is not a very impressive clinical type of hypertension, and its counterpart is the hypertension which follows resection of the glossopharyngeal and aortic depressor nerves.

Last among the "neurogenic" types is the so-called "emotional hypertension." There is much discussion today as to whether hypertension can arise on the basis of pure psychogenic stimulation. In short, is there such a thing as a hypertensive personality, and can continued emotion over a sufficiently long period ultimately lead to elevated and persistently elevated blood pressure?

IRVINE H. PAGE

LET US take another group of patients, the cardiovascular. Most startling of these is coarctation of the aorta. In coarctation one has a typical example in which, when the outflow of the blood is impeded by means of a constriction of the aorta, elevated blood pressure occurs proximal to the obstruction. There are other varieties.

The more we have examined the question of whether lead poisoning itself can produce hypertension the more doubtful it becomes. If any of you are in a position where you can examine patients who have been subjected to lead poisoning, you would be doing the field of hypertension a favor if you would see whether hypertension really is more common among people with lead poisoning than among the normal population.

You all know about periarteritis nodosa, so discussion of it will be omitted. Heart block is not a very impressive cardiovascular type in which hypertension at times is found.

Endocrine types of hypertension occur, many of which, as you know, are very striking. Of these the pheochromocytoma is perhaps the best known, but there are also Cushing's syndrome and Cushing's disease — basophile adenoma and pituitary basophilism. The experimental counterpart of these in dogs with experimental hypertension is lacking but its opposite is of some interest. If the hypophysis is removed, a fall in blood pressure occurs, but it is not a very marked fall. It seems as though it were a secondary fall owing to withdrawal of stimulation of the adrenal cortex. The pheochromocytoma is a typical example of endocrine type of hypertension, in which it is clearly demonstrated that the liberation of a large amount of adrenalin causes the hypertension.

Let me call your attention to a rather interesting finding about these tumors. It is gradually becoming apparent that some patients who appear to have essential hypertension actually suffer from pheochromocytoma. Don't be too sure when you see a patient without the classical signs of paroxysmal hypertension with increased cardiac activity and sweating, pheochromocytoma is necessarily ruled out. More and more cases are turning up which look as though they were essential hypertensives. Therefore, it is worth keeping in mind and worth using the injection of 0.5 mg. of hista-

mine, the Roth-Kvale test, to see if you cannot bring on the signs and symptoms of a paroxysm of hypertension. An elevated basal metabolism should also cause suspicion of this tumor's presence. There is no experimental counterpart to pheochromocytoma.

The adrenal cortical carcinoma as well as pituitary tumors reproduce Cushing's syndrome, and these are impressive types of hypertension. You all recognize them. There has been no similar type of hypertension induced in experimental animals. The only pertinent experiment in an animal with experimental hypertension is the state induced by removal of both adrenal cortices. The blood pressure falls to normal or below, indicating quite clearly that the adrenal cortex is one of the important parts of the mechanism of hypertension. How important we do not know, but the search is one of the great movements that will, I think, be undertaken in the next few years.

The other disease state producing the predominantly endocrine type of hypertension is far less important. It is the curious carcinoma of the thymus described by Turnbull, which seems to produce Cushing's syndrome.

The thyroid as an endocrine cause of hypertension is not important because it produces a systolic type of hypertension, not a diastolic one, and one which is presumably due to increased activity of the myocardium with increased cardiac output.

We have studied a large group of women at the menopause and have come to the conclusion that there is no such thing as "menopausal hypertension"; that belief in this as an entity is simply due to the fact that patients in menopause are at the age when they are most likely to develop hypertension anyway. The confusing notion has so arisen that the ovary is in some way etiologically concerned in the production of hypertension. The latter, I think, is probably not true.

THE last type is the renal. The classical example is the hypertension associated with Bright's disease. Another excellent one is that

Development of a perinephric hull on dog kidneys wrapped in silk.

associated with pyelonephritis. There are possible experimental counterparts: hypertension, for example, associated with the injection of bacteria into the kidneys. The most reproducible is the Goldblatt method of producing hypertension by means of the clamp on the renal artery.

Whether hypertrophy of the prostate with stasis in the ureter produces renal hypertension is not certain. I am not at all convinced that compression of the ureters can produce hypertension.

There is just one other example of renal hypertension that I want to discuss because knowledge of it is not as common as I had thought. We have produced hypertension by means of wrapping the kidneys in cellophane or silk. As a result, an extraordinary perinephric reaction is produced with elaboration of a thick hull around the kidney. This also has clinical counterparts. People who have had an injury to their kidneys or have had an operation in which there has been a good deal of manipulation of the kidneys develop from time to time a perinephric reaction with the production of a hull around the kidney which produces hypertension. I suspect the Wilms' type of tumor which presses on the renal parenchyma also produces hypertension as the result of this mechanism.

Another example in which this mechanism is involved and which we have seen clinically is that of a lymphosarcoma which invaded the lumbar gutter. When it finally caught the renal parenchyma, it gave the kidney a squeeze and up went the blood pressure.

The accompanying illustration shows the development of a perinephric hull on dog kidneys wrapped in silk. I would like to make this suggestion to you: to make the diagnosis, all that may be necessary is to stick a blunt needle in until you feel the kidney's hull. At times it is possible to recognize the lesion without actual operation. The removal of this type of kidney may result in cure of the hypertension.

I WANT to see now if you can gather what I set out to do, namely, to show you that if patients with essential hypertension are analyzed on the basis of what is known of hypertension mechanism, an extremely interesting classification may often be uncovered. In other words, instead of the old business of measuring blood pressure and excretory function and grading the disease according to severity, one can perhaps arrive at least at a beginning of an etiologic classification. The hypertensive becomes a mosaic in which the central nervous system, the endocrine glands, and the kidneys, all contribute their part in varying degrees.

What are examples in patients of participation, for instance, of the nervous system? I might call these the neurological panel. One thinks immediately of headache, blushing, sweating, irritability, lacrimation, tachycardia, cardiac pain, transient paralysis, confusion, paresthesia, and stroke. I think you will all admit that in the hypertensive there is a pretty reputable representation of the central nervous system.

The endocrinologic panel is one which is now very much under discussion, and I think that in the experimental field a great deal of investigation will be done in the next few years on the participation of the endocrine system in the genesis and the maintenance of hypertension. Participation of the endocrine system is shown by a wide variety of signs and symptoms: hair and fat distribution, menstrual disturbances, diabetes, abnormal urinary steroids, edema, and salt retention, to mention but a few.

TABLE 1

CLASSIFICATION OF EARLY HYPERTENSION

SIMPLE VASOMOTOR LABILITY	Transient and irregular episodes of elevated blood pressure, chiefly systolic, associated with increased heart rate and usually some obvious emotional stimulus. The characteristic clinical and laboratory picture of essential hypertension is not present. The latter does not necessarily develop.
PRE-HYPERTENSION	These patients respond as do those with simple vasomotor lability and probably develop hypertension.
NEUROGENIC HYPERTENSION	These patients have established early hypertension but on a "neurogenic" basis, i.e., with signs and symptoms of nervous hyperactivity.
EARLY ESSENTIAL HYPERTENSION	These patients have established hypertension chiefly on a humoral basis with early arteriolar disease.

The humoral panel is next, and possibly it should not logically be separated from the endocrine panel. I am making a little intellectual jump here. This is really the renal panel, but I am assuming that the kidney participates as an incretory organ. Its internal secretion is poured into the blood, and it is this internal secretion I am terming the humoral mechanism. This is the renal-vasopressor pressor system which involves renin. Renin acts on renin substrate to produce angiotonin (hypertensin) and it is angiotonin or, more probably, a complex of this substance with others that raises the blood pressure.

What evidence have we for the activity of the humoral panel? In patients with hypertension there is one very characteristic intrarenal hemodynamic change, namely efferent arteriolar constriction with relative maintenance of glomerular filtration and reduction of peritubular blood flow. Angiotonin reproduces this change with great fidelity. Dr. Corcoran will

discuss this in greater detail. Increased cardiac effort is also a very characteristic sign of hypertension in patients, as is arteriolar vasoconstriction. Both result when angiotonin is injected. Yet angiotonin as we now know it is probably not the agent actually causing the rise in blood pressure in hypertensives. It is my opinion that it is some substance very closely allied to it, or as I have already pointed out, a more complex protein.

What I have tried to do is point out that there is the possible participation in every patient with hypertension of all of these different mechanisms. Controversy arises for lack of appreciation of the multiple nature of this disease. In one patient the influence of the nervous system may be predominant while in another it may be the adrenals. So it is that the greater or lesser participation of each of these various systems determines the final clinical picture.

THERE is one more subject I want to discuss with you, and that is a useful clinical classification without regard to etiologic mechanisms. Simple vasomotor lability is the first group. Table I shows exactly what I mean by that. These are usually the patients who one thinks at times are essential hypertensives and at other times are exhibiting a slight transient rise in blood pressure due to emotional instability. I think it is wise, perhaps, to include in our classification, "simple vasomotor lability," with the idea that many of these people never develop essential hypertension. Let me call your attention to the next grouping, the "pre-hypertensive." This is the group that will ultimately develop hypertension, and so I have posed one of the most important problems that face those interested in cardiovascular disease, the differentiation between those patients who have simple vasomotor lability and those who are going to develop essential hypertension later on. The latter constitute the majority of youngsters with elevated blood pressure. I am sorry that I must gloss over the differentiation, for to me it is one of the fascinating problems that now faces us.

TABLE 2
CLASSIFICATION OF HYPERTENSION

RENAL

A. AFFECTIONS OF VESSELS

Arteriosclerosis	Scleroderma
Arteritis	Vascular anomalies and obstructions (embolism, venous or arterial thrombosis, aneurysm, tumor)
Panateritis nodosa	
Visceral lupus erythematosus	

B. AFFECTIONS OF PARENCHYMA

Acute nephritis	Hypernephroma
Chronic nephritis	Ectopia
Pyelonephritis	Toxemia of pregnancy
Hydronephrosis	X-ray lesions
Polycystic disease	Renal stones
Amyloidosis	Hypogenesis
Infarcts	Dystopia
Tumors	

C. AFFECTIONS OF PERINEPHRIC STRUCTURES

Perinephritis	Retroperitoneal masses causing pressure on parenchyma
Tumors	
Hematoma	Wilms' tumor

D. AFFECTIONS OF URETER

Obstruction (pelvis, ureter, prostate, urethra)	Pyelitis

CEREBRAL

Increased intracranial pressure (trauma, tumor, inflammation)	Anxiety states
	Lesions of brain stem (ascending paralysis, poliomyelitis)
Diencephalic stimulation	Acute prophyria

CARDIOVASCULAR

Heart failure	Coarctation of aorta
Arteriovenous fistula	Atheromatosis
Heart block	Polycythemia

ENDOCRINE

Pheochromocytoma	Acromegaly
Adrenal carcinoma	Thymic carcinoma
Adrenal hyperplasia (?)	Hyperthyroidism
Chorionepithelioma	Arrhenoblastoma
Adrenal-like ovarian tumor	Cushing's syndrome
Pituitary basophilism (?)	

UNKNOWN

Essential hypertension	Malignant hypertension

We next go a little higher in the scale and have what might be called a strictly "neurogenic" type of hypertension. I include among this group those patients we described as the "hypertensive diencephalic syndrome." This is a group in whom the neurogenic participation seems to be so great that one can almost confidently say that it is one of the prime mechanisms involved in elevating the blood pressure.

The next group is the "early essential hypertensive." When the hypertension is established,

suffice it to say that it has some very typical, characteristic patterns and the measurement of the blood pressure alone is not sufficient to characterize it. It is defined by a wide variety of signs, symptoms, and hemodynamic changes, of which the rise in arterial pressure is only one of the important ones. It would lead us too far afield to discuss these now.

Table 2 will give you the classification of the phases of essential and malignant hypertension. As you see, these are chiefly characterized by periods in which there is compensation of the vascular system and during which there are no signs and symptoms resulting from the elevated blood pressure, and the period of decompensation when signs and symptoms of cardiac, cerebral, and renal failure begin to make themselves felt.

I will close by saying that this is just a trial balloon to interest you in bringing the subject from a static into a dynamic state, because it is only in this way that we will begin to classify satisfyingly this vast group of patients. I will leave you with the thought that you yourselves will add to and subtract from this classicfiation to keep it alive and to make it useful and true.

II. MANAGEMENT OF HYPERTENSIVE PATIENTS

R. D. Taylor, M. D.

It is my lot to review those things that are helpful in the management of patients with hypertension. In the management of a hypertensive we must constantly remember the disease is a chronic one. The average case of essential hypertension probably extends over a period varying from twenty to thirty years or more. The care of a disease of such duration is probably more nearly perfect if the patient knows as much as possible about his problem. After all, he is the only one who is with himself twenty-four hours of every day. Only he can do those few things that spare the heart and blood vessels unnecessary work and strain. We feel it is mandatory that persons who have vascular disease accompanied by hypertension be as well informed as a patient with diabetes and should know thoroughly those things he can do to help himself. There are not many. However, a program of scheduled rest which divides the day into periods of activity limited to three or four hours each is distinctly useful. These people should have plenty of rest at night. They should avoid unnecessary emotional and physical expenditures of energy. Certainly such a program makes the patient feel better if for no other reason than that he is doing something about his problem. Further, a routine might lessen the tendency of hypertensive patients to go from doctor to doctor and clinic to clinic. All of you have had patients who have gone elsewhere and then returned. You have all seen patients who have come to you after having left the care of other men. This wandering might be lessened and the patient might receive better care if he once accepted the fact that his disease is chronic and, at least to date, cannot be cured in most cases.

In a discussion of the care of people with hypertensive vascular disease it is logical to consider first that group of persons in which the disease is just beginning. The recent screening of young people by physical examinations for the armed forces has pointed out that many young people in their late teens and early twenties have hypertension. Dr. Page told you it is impossible to pick out with complete assurance which person is going to develop vascular disease and which will simply have a labile blood pressure all his life. The latter are probably in the minority, and until we can divide the one from the other it is wise to assume that all these youngsters will some day have cardiac, renal, or cerebrovascular disease.

When a young man of eighteen or twenty years presents himself with hypertension, he

usually has no symptoms and needs no active treatment. After having excluded the possibility that hypertension is secondary to nephritis, thyrotoxicosis, etc., about all one can do is to explain the problem to the patient. He should know that by the time he is thirty-five he is apt to have blood vessel disease unless he does everything possible to prevent its onset. He should avoid those types of living which wear out blood vessels, and I think that we all know what those are. The practice of medicine is certainly not excluded. If symptoms such as tachycardia, insomnia, and transient headache are complained of, liberal use of mild sedatives such as phenobarbital, chloral, and bromides is certainly indicated.

The most important phase in the management of these young hypertensives is the emphasis that should be placed upon the value of examinations during the coming years. Examination should be performed at least every eighteen to twenty-four months. If at any time during this series of observations one finds evidence of advancing blood vessel disease, persistent hypertension, or incapacitating symptoms, strong consideration should be given to the advisability of suggesting some type of operation upon the sympathetic nervous system.

R. D. TAYLOR

SYMPATHECTOMY is a treatment which has grown up during the past twenty years. It has been subjected to much controversy and as yet there is no unanimity of opinion about which patients should be operated upon. Everyone agrees that younger candidates do better, as well they might, inasmuch as the disease has many years to go if nothing is done. There are nonetheless some cases with well-established essential hypertension and an occasional one with malignant hypertension who do well after operation. Many tests have been devised to select which patient is going to be helped, but as yet none is infallible. You all know of the pressor test, the sedation test, the degree of elevation of the systolic pressure as compared with the diastolic pressure, the age, and renal function. These have failed to tell us which patient is going to be benefited by operation.

More recently we have tried the tetraethyl ammonium compounds, inasmuch as they have been shown to have a depressant effect upon the autonomic ganglia. However, even this was not helpful in predicting which patient was going to have a normal blood pressure after operation.

We have reviewed our records and have come to the definite conclusion that those patients who did best after operation looked younger than their years. We decided that we were quite original in the thought that patients who were physiologically young did better, regardless of the severity of the disease. We looked excitedly for a means of measuring this but as yet have found none. We did note that as long ago as 1939 Dr. George W. Crile, Sr., had made a similar observation among those patients he subjected to celiac ganglionectomy. The thought then is hardly original, but it apparently is true and persons who are physiologically young do well after operations on the sympathetic nervous system.

The type of operation that is probably most widely used is the modification devised by Dr. Smithwick. He removes the sympathetic ganglia from the eighth or ninth dorsal segment down to the second or third lumbar and at the same time the sympathetic chain and the splanchnic nerve. This operation we feel, as do many others, is probably the most effective one now being performed for the treatment of arterial hypertension.

FOR PERSONS who have well-established hypertension with blood vessel disease that can be demonstrated in the eyes, the heart, the kidneys, there are other types of treatment which probably are helpful. You have heard of potassium thiocyanate, and I am sure you have all used it. It has been a medical agent ever since the time of Claude Bernard back in the late 1800's. In 1934, Dr. M. Herbert Barker made it possible for us to use this drug and at the same time control the amount present in the body so that therapeutic results might be achieved without endangering health.

This drug is not a cure-all for hypertension by any means. We believe it has very specific indications and that it probably has very little direct effect upon the blood vessels or blood pressure. If not carefully used, it can get one into trouble. The following case of Mrs. S. is illustrative of this point. She is forty-one years of age. She came in complaining of fatigue, dyspnea and ankle edema; shortly before she was admitted to the hospital she had a bout of very definite cardiac asthma.

Her hypertension had been known for a period of four years. At the beginning of this four-year period she had some headache. Her physician gave her potassium thiocyanate and told her to take 0.2 gm. three times daily. This controlled the headache but gradually she developed more dyspnea, blurring of vision, ankle edema, and, just before she came into the hospital, nocturnal dyspnea.

On examination her blood pressure was found to be 198/120, her pulse rate 100. Retinal blood vessels showed characteristic narrowing and sclerosis; her lungs contained râles throughout; her liver was palpable and tender; the heart was enlarged to the left; there was a reduplication of the first cardiac sound, and she had ankle edema. The electrocardiogram showed changes often associated with hypertensive heart disease. There was left axis deviation, depression of the ST segment in leads I and II, and the precordial leads IV and V. T waves in the precordial leads were inverted.

Apparently this busy doctor had given her potassium thiocyanate, feeling it would take care of her hypertension. It was thus possible for him to overlook completely the congestive heart failure which gradually disabled her. In addition her potassium thiocyanate blood level had reached 25 mg. per 100 cc. of serum, which is more than two and a half times the safe therapeutic level. As a possible result of this she had extreme fatigue, marked weakness, and a blood hemoglobin of only 9.5 gm. per 100 cc. As you know, thiocyanate can induce a hypochromic anemia in patients who take it over a long period of time. Since the drug was discontinued and her heart compensated, she has been entirely free of symptoms.

To repeat, we do not feel that thiocyanate is a cure-all for all persons with high blood pressure, but there are specific indications for its use. It should be given only when the blood level can be measured and the serum concentration accurately known. In connection with this, if one reviews those cases of fatality associated with the use of thiocyanate he finds that not one of them occurred in a patient whose blood level had been maintained at safe levels.

During the years we have tried to decide when thiocyanate should be used. Recently we examined the records of 100 representative patients who had been treated with this drug. Fourteen patients had very early essential hypertension or "neurogenic hypertension." There were 73 who had well-established essential hypertension. Seven had malignant hypertension, 5 had hypertension secondary to arteriosclerosis involving the aorta and other large vessels, and 1 had chronic glomerulonephritis.

We found, as have others, that among these

patients thiocyanate primarily relieved headache. Sixty-three of these 100 persons had some degree of symptomatic relief of distressing headaches. Eighteen of them noticed decrease in the emotional instability, tenseness, or nervousness which so frequently attends essential hypertensive vascular disease; 12 of them noted less dizziness and lightheadedness, which is a common complaint; 10 of them no longer complained of palpitation and excess cardiac activity; 8 of them no longer noted fatigue and were more able to carry on normal activity and gainful employment. Five of them ceased to complain of the vague precordial pain and distress which so often goes along with hypertensive vascular and cardiac disease; 5 of them no longer had insomnia, and 2 of them were relieved of dyspnea.

IN SUMMARY we believe the prime indication for administering this drug is headache. In this group, 63 per cent of them had some degree of relief from headache. Dr. O'Hare has reported as high as 75 per cent. Dr. Barker, who originally gave us the method for measuring blood serum levels, has reported 70 per cent relief. Patients who have hypertension complicated by headache and emotional instability are often benefited by the use of thiocyanate.

Coincidental with the relief of headache, emotional instability, and insomnia, there is often some reduction of blood pressure. This reduction of blood pressure probably occurs because the patient feels better and rests better. It is not unlike that fall in blood pressure which is observed following the use of phenobarbital or other sedatives No one has demonstrated that thiocyanate has any specific effect upon blood vessels, or that it can reduce the blood pressure of animals with normal or elevated blood pressures directly, or that it has any direct effect upon the blood vessels of persons with hypertension.

It is not a perfectly innocuous drug, and in this group of patients there were 24 who developed symptoms immediately after the drug was started. The most common complaint was very marked fatigue and asthenia. This occurred in 14 per cent of these few patients, but it does not necessarily mean that the drug has to be discontinued. As the patients become accustomed to it and the body builds up a tolerance, the fatigue becomes less troublesome. We usually ask the patients to continue the drug for a period of three to four weeks in the hope that this asthenia will disappear.

Six patients complained of nausea and vomiting. When the desired serum levels were arrived at slowly and the patients developed a tolerance to the drug, 4 of these 6 were able to continue with it. Three had some diarrhea, and, again, careful and slow administration made it possible for these persons to get the beneficial effects of the drug without the unpleasant ones.

One patient developed angina on three different occasions. As you know, precipitation of coronary thrombosis and myocardial infarction has been laid to use of potassium thiocyanate.

Two to fifty-four months after thiocyanate had been prescribed other symptoms appeared. Eight of 100 patients developed dermatitis; 3 had purpura. One of these had such extensive hemorrhagis phenomena that there were hemorrhages in the eyegrounds, in the mucous membranes, and throughout the body. Two patients had some vague aches and pains in the muscles and joints and 2 developed classical myxedema, much like that that can be induced with thiouracil and propyl thiouracil.

All these symptoms disappear very promptly when the drug is discontinued, and often the patients request that it be reinstituted after it has been discontinued from four to six weeks. In over 50 per cent of these patients who developed toxic symptoms the drug could be restarted with no recurrence after a rest period of four to five weeks. In the case of myxedema, desiccated thyroid by mouth completely controls this and the drug can be used indefinitely without further sign of myxedema.

To summarize very briefly, hypertensive patients should be told about their disease and they should know how to take care of themselves. Young persons with hypertension should be watched for many years. If the disease pro-

gresses, an operation is probably indicated. Persons with essential hypertension probably deserve a chance at operation, regardless of the severity of their disease, provided it is advancing. Thiocyanate is useful in those persons who complain of headache, lightheadedness, and emotional instability. None of these treatments will cure hypertension. Some day we hope that we will have improved upon the kidney extracts which were described in the late 1930's and early 1940's and that we will be able to manage this disease much the same way as we can now manage pernicious anemia; however that, I think, is some time in the future.

III. CASE DISCUSSION

A. C. Corcoran, M. D.

The case to be discussed is that of a forty-three-year-old farmer. About a year ago he was shown to have some slight increase in blood pressure in a routine examination done as a pre-employment measure. He was at that time asymptomatic. Three months ago, that is to say, nine months after the initial elevation of blood pressure was discovered, there appeared some activity of the disease. He observed severe daily throbbing headaches, nausea, a weight loss of about twenty pounds, dyspnea and palpitation, nocturia at least twice, and increasing mental incapacity and confusion.

On physical examination he was restless; his blood pressure was greatly elevated, 260/180; his fundi showed papilledema, exudates, and hemorrhages. The lungs were clear; the heart enlarged slightly with a systolic apical murmum; there was no gallop rhythm; the abdominal examination was negative; there was no edema, and the reflexes were normal.

In the various laboratory examinations the electrocardiogram showed signs of coronary artery disease. Examination of kidney function showed in the concentration test a maximum specific gravity of 1.019, and proteinuria of about 5.0 gm. per 24 hours. His urea clearance was 75 per cent of normal, which is at the lower edge of the normal range. His blood urea was 36 mg. per 100 cc.; his hemoglobin 14 gm. per cent. A more critical examination of his renal function showed a renal blood flow of 700 cc., which is roughly two-thirds of the normal; a glomerular filtration rate of 90 cc. per minute, which is almost normal; and a slight reduction of tubular secretory capacity. The clinical and laboratory pattern is characteristic of malignant hypertension.

We shall turn now to consider the basis of these kidney function tests and their application to the study of this patient. The kidney and its function occupy a central position in the clinical study of hypertension, because, as Dr. Page has shown you, it may participate in the disease as a causal agent and, as we all know, it is usually damaged as a result of the hypertensive process, especially in cases of malignant hypertension.

Present-day means and knowledge have not advanced to the point where in any particular patient we may assess the presence or degree of causal participation by what Dr. Page referred to as the renal humoral factor. The exploration of this, the pressor endocrine aspect of renal function, remains to be completed as a clinical laboratory test. However, means for the study of renal excretory function are very complete. It is now possible, as I have indicated in reading this case history, to determine without any discomfort to the patient the rate of renal blood flow and the rate at which fluid filters through the glomeruli of the kidney, and to estimate the amount of functioning renal tissue from the secretory capacity of the tubules.

The methods for these measurements are unfortunately still too complex for routine use. However, it seems likely that we shall soon be

able to recommend simpler techniques which may make this valuable information available in routine clinical laboratories. In the meantime, simpler tests are available. Their evaluation in terms of physiologic function enables them to yield much information.

A. C. CORCORAN

THE kidney is an important aspect in the study of hypertensive disease because it is one of the most vascular tissues of the body. A case of the injected renal arterial tree from which the kidney tissue has been dissolved away shows that the kidney is practically a mass of small arteries and arterioles. Arterioles are, as you know, the tissue most affected by the hypertensive process. Arteriosclerosis is the characteristic lesion of hypertensive disease. It is, therefore, not surprising that the kidney, consisting, as it does, disproportionately of arterioles, is disproportionately affected by this process.

If we now examine a portion of this specimen and compare injections of a renal interlobular artery with attached arterioles and glomeruli in a normal subject and in a patient who has suffered from hypertension, we find an obvious difference in their vasculatures. The vessels of the hypertensive's kidney show straightening due to sclerosis together with abnormalities of pattern, and here and there complete loss of glomeruli and afferent arterioles as the result of obliteration. The lesions consist of sclerosis of small arteries and arterioles with obliteration of arterioles leading to death of tissue beyond or, if only partial, to functional impairment. In malignant hypertension its progress is accelerated and its nature somewhat changed, in that necrosis predominates over sclerosis.

The tissue lost as the result of obliterative arteriolar damage is the nephron, the unit of renal structure and function. The vascular part of the nephron, which is primarily affected, consists of afferent arteriole, glomerulus, efferent arteriole, and peritubular capillary. Its epithelial part consists of Bowman's capsule and the renal tubule. Each kidney consists of about a million such units. The progressive damage and destruction of these is the basis of renal functional impairment in hypertension. In this disease the initial and predominant lesion is sclerosis or actual necrosis of the afferent arteriole.

The concurrent functional change, which we believe to precede the organic damage, consists in arteriolar constriction. This is present throughout the body. It is especially significant in the kidney, principally because there are so many arterioles concentrated here. This constriction occurs in both afferent and efferent arterioles. As a result of efferent arteriolar constriction, the back pressure of blood in the glomerular capillaries is increased. This pressure in the glomerulus determines the volume of glomerular filtration. Consequently, if there were no other functional change, the hypertensive would tend to increase glomerular filtration beyond the normal. The concurrence of arteriolar constriction with the increased glomerular pressure actually tends to limit the flow of blood or, as in our patient, to decrease

it quite significantly. However, in spite of decreased blood flow, the hypertensive very often maintains a nearly normal glomerular filtration rate. The cause of this is the increase in filtration pressure which squeezes relatively more water out of less blood.

This fact has its application in the interpretation of a commonly used test of renal function, the urea clearance. Urea is present in the water of the blood and is filtered with it through the glomerular capillaries. It passes down the tubule, a fraction diffusing back into the blood, but most of it, about 60 per cent, going on to the bladder and excretion. The fraction diffusing back is relatively constant when the test is performed under proper conditions. Consequently the urea clearance test measures glomerular filtration. Since this is so, it follows from what we have seen, that many hypertensives, in spite of renal vasoconstriction sufficient to result in renal ischemia, do not show evidence of decreased glomerular filtration, in that the urea clearance is normal. The reverse would be the case in a renal disease in which glomerular filtration was the principal function damaged, as for instance, in glomerulonephritis and eclamptogenic toxemias of pregnancy.

THEREFORE we have to have recourse to another test. This is the concentration test, which is the most delicate simple test of renal damage. It is done by collecting urine during the last twelve hours of a twenty-four-hour fluid-free period. The specific gravity of this specimen should be greater than 1.026. Failure to reach this level of specific gravity indicates that the tubules are for some reason unable to do reabsorptive work. When they become incapable of such work, or are overwhelmed by the work they do, the specific gravity is fixed at 1.010. Thus, in the region between 1.026 and 1.010 the concentration test indicates the working capacity of the tubules.

In the case of our patient this capacity is damaged, for he can only concentrate urine at 1.019. The nature of this damage is not clear. The capacity of his tubules to secrete foreign substances such as diodrast or p-aminohippurate is not impaired, so that it seems likely that he still retains a normal mass of tubular tissue. The explanation may lie in the fact that this normal mass of tissue is being nourished by only about two-thirds of its normal blood supply. Whatever the nature of the defect which causes hyposthenuria, this finding is very common in hypertension. A scatter-chart of urea clearance and concentration tests in patients with even mild essential hypertension shows this same phenomenon, maintenance of urea clearance at normal levels because of high intraglomerular pressure and depression of concentrating power because of tubular loss or tubular ischemia. Thus, in hypertension at least, the simple test of urinary concentrating power by the method of Addis yields information that is highly critical and significant.

The information obtained from these tests when sufficiently detailed may serve to indicate the nature of the renal damage. It also indicates its extent and thus is an important index in prognosis. But it would be rather disheartening if we were able to gather no more knowledge than a gloomy prognosis from successive tests of renal function. Hitherto it has seemed rather hopeless to consider the possibility of improving damaged renal function. More recently, we have shown with others that the administration of very large doses of vitamin A concentrate to patients with renal injury sometimes results in quite dramatic restoration of function towards the normal. The nature of the agent present in these concentrates and responsibility for this renotrophic effect is not clear. It is almost assuredly not vitamin A. It is probably a substance of somewhat similar chemical characteristic and present in the concentrate in rather low concentration. Because it is present in low concentration and, as it appears, rather irregularly, the administration of such concentrates to patients is frequently ineffective in increasing renal function. We are therefore attempting to isolate and identify this factor so that we may perhaps obtain a potent material capable of improving renal function and combining with this a study of other renotrophic agents.

DIAGNOSTIC CLINIC

Carcinoma of the Stomach

ROY D. McCLURE*

HENRY FORD HOSPITAL, DETROIT

WHEN I was a student, we were taught that cancer of the stomach was an entirely hopeless disease. My message to you is that cancer of the stomach is no longer an entirely hopeless disease, because in our clinic we have some patients alive sixteen years and longer after resection of the stomach.

Dr. M. Kessler has a case which he will present to illustrate this point. The patient is alive six years after operation here in Cleveland, and his case emphasizes so well the fact that we should not regard this disease as a hopeless one.

DR. M. KESSLER: This patient is a Negro male, sixty-one years old, who was admitted with the chief complaint of pain in his stomach pit, which had begun approximately six months before admission. At that time he had noticed a dull ache in the epigastrium which came and went every half hour. This was not related to meals, and he said that he had obtained partial relief with the use of alkalizing agents.

Prior to admission the patient had been constipated, and the constipation became progressively worse. He claims to have lost at least ten to twelve pounds before admission. No tarry or abnormal stools were noted. He was admittedly a heavy drinker.

On physical examination at that time we saw an emaciated, dehydrated patient who had apparently lost considerable weight. No adenopathy was present.

On abdominal examination a 10- to 12-cm. mass was palpable in the upper epigastrium, just to the left of the midline. This was slightly tender to pressure. The mass was not movable but was not attached to the skin. So far as his clinical data were concerned, his red count was 3,500,000 and his white count 10,000. His differential was not remarkable. His feces presented 4+ benzidine. Gastric analysis revealed no free hydrochloric acid, and his total acidity was fairly low throughout. Frank blood was found in the gastric material. X-ray examination revealed filling defect of the lower pyloric region and the radiological diagnosis of carcinoma was made.

Approximately five days after admission, under spinal anesthesia a subtotal gastric resection and posterior gastroenterostomy was performed. Postoperatively the patient fared well and was ultimately discharged approximately one month after admission.

*Surgeon-in-Chief, Henry Ford Hospital, Detroit, Michigan.

NOTE: Presented before the meeting of the Interstate Postgraduate Medical Association of North America, Cleveland, Ohio, October 15 to 18, 1946.

The pathological report was we'l-differentiated adenocarcinoma of the stomach with extension to the liver capsule and chronic hypertrophic gastritis.

The patient is now living and well six years after the surgery was done.

DR. MC CLURE: May we have the surgeon's name who operated on him?

DR. KESSLER: Dr. Ferrero.

DR. MC CLURE: I think he deserves credit because that was the type of patient we used to see who came to us late. We were taught that the diagnosis could be made by loss of weight, digestive disturbance, blood in the stools, and palpation of a mass in the abdomen. This patient had all these signs and symptoms, plus x-ray evidence of a filling defect in the lower end of the stomach to confirm the diagnosis. This patient did not see a doctor at an early stage, but in spite of this delay, he is alive six years later.

ROY D. McCLURE

Forty years ago, when I was in medical school, no one in America, as far as I know, was doing gastric resection for such a patient. I know that neither Dr. Finney nor Dr. Halsted, with both of whom I worked, would have done more than open and close the abdomen, except perhaps for a posterior gastroenterostomy.

The first really successful resections of the stomach, which I saw more than thirty years ago, were performed by Dr. Donald Balfour of Rochester, Minnesota. Never have I seen operations done with greater skill and ease than he did them then, in those years long ago, and I imagine that he has many patients alive at this time.

The first operation apparently was done by Billroth for resection of the stomach about 1881. One of his students, Woelfler, went up to the University of Prague, and it was my good fortune to be working in pathology there just forty years ago. When we were through with our autopsies in the morning, we would drop over while Dr. Woelfler was still operating. Woelfler was the first man to perform a posterior gastroenterostomy.

The patient whose case was discussed is especially interesting to me because, from the description given by Dr. Kessler, it was not a Polya or modification of the Polya operation, but a Billroth II operation that was done. You remember the Billroth I operation was resection of the pyloric end of the stomach, bringing the duodenum, if it could be mobilized sufficiently, across the midline and anastomosing to the stomach. This case, as Dr. Kessler described it, was done by resecting the lower half or more of the stomach, and then bringing the jejunum up and doing a posterior gastroenterostomy, which was called by Billroth the Billroth II operation for resection.

The advent of the more general use of x-ray examinations, and the light shed on the ulcer-cancer relationship, especially brought out at the Mayo Clinic, brought more and more cases with early gastric carcinoma to the surgeon. Renewed interest in this subject resulted in the development of the modern operation for gastric cancer, which, as now practiced, fulfills all the requirements of modern cancer surgery.

The importance of this subject cannot be

overemphasized, for cancer attacks the stomach with greater frequency than any other organ in the male body. In this country in 1943 there were 25,720 deaths from cancer of the stomach. This accounted for approximately one-third of the 76,000 persons whose death was due to cancer of the gastro-intestinal tract. There were 20,000 who died from cancer of the intestinal tract, 10,000 from cancer of the rectum and anus, and 9,000 from cancer of the mouth and pharynx.

Women appear to be definitely less susceptible to cancer of the stomach. Whether this will change or not I do not know, since they are using more alcohol and tobacco. Thus, a statement that cancer of the stomach is the commonest of all cancers holds true only for males and the general population. Cancer of both the uterus and breast outrank, by a considerable margin, carcinoma of the stomach as a cause of death in women. I think there is hope, because with the new study of estrogens and what-not, some progress surely is to be made along that line.

I remember in 1938, Dr. Ogilvie appeared before the clinical congress of the American College of Surgeons, and made the statement that operability of patients with cancer of the stomach was lower than that of patients with any other growth, that the mortality was the highest of any major operation, and that the curability among those that survived was the lowest in cancer surgery. This very gloomy picture has become brighter during the past seven years, but it is still far from glowing.

Advances have been made in all three possible means of attacking the problem of cancer of the stomach—earlier diagnosis, lower operative mortality, more radical operative procedure. The greatest triumph, of course, has come in the lowering of the operative mortality. The Mayo Clinic figures may be taken as representative of this trend. From 1907 to 1938 the resectability rate of cancer of the stomach was 25.5 per cent; the mortality rate there was 16.2 per cent. In 1943 their figures were 58 per cent and 5 per cent, respectively—a tremendous improvement. For the earlier period Ogilvie puts the operative mortality at between 20 and 30 per cent and the resectability at 20 per cent. His figures for the period of 1938 to 1944 are not available, but undoubtedly he too has shown this marked improvement.

The increased resectability rate means that patients are seeking advice earlier than formerly, that practitioners, in general, are more alert to the early signs of cancer, and that they are availing themselves more freely of the diagnostic aid afforded by x-ray examinations. Encouraging as are these results, much still remains to be done along these lines.

As to earlier diagnosis, I know we get tired of hearing that, but that is where the greatest hope lies. There is great need, we think, for cancer detection centers. We also like to lay emphasis on the yearly examination of patients. That is a thing that we followed for years, but during the war it could not be done. In the yearly examination of patients we found many cases of cancer of the breast, cancer of the stomach, and cancer of the uterus. We found that patients came for operative or x-ray treatment at a much earlier date. It is essential, too, that those of us in general practice should become more cancer-conscious; for until the family doctor thinks about cancer and comes to the point where he considers the ill-health of any middle-aged patient who consults him as possibly being due to cancer, then, and then only, will the early diagnosis of cancer become a reality instead of just a hope.

Loss of weight, disturbance of the digestive function, blood in the stool, and a mass felt in the abdomen, usually mean that operation is much more difficult. If there is metastasis, it is most frequently to the liver, to the glands of the peritoneum and by direct growth into the pancreas and into the spleen. True, all these are signs of cancer, but of late cancer, and if the observer or physician waits for these to develop before making the diagnosis, the surgeon can offer much less chance of cure by suggesting operation.

The early signs of cancer of the stomach, of

course, are any digestive disturbances occurring in patients past forty years of age. When all patients in this group, who have even minimal gastro-intestinal symptoms lasting more than two weeks, are subjected to x-ray examination, a beginning will have been made on the problem of early diagnosis of gastro-intestinal tract cancer.

We used to lay great emphasis on the matter of hypo-acidity in these cases. We find many patients now with no acid in their stomachs who do not have cancer, and who sometimes go through life without developing cancer.

The question of early detection of malignancy of the stomach and colon has received a great deal of consideration in our hospital, as well as in other clinics. Different groups of people see the patient. We have a gastro-intestinal division and an x-ray department. All patients with any gastro-intestinal symptoms who come into the clinic receive a complete gastro-intestinal x-ray. Although only one barium enema in 100 reveals cancer of the colon, and only one x-ray out of 50 stomach pictures gives positive evidence of gastric cancer, we are constantly being rewarded by detecting these early cases.

The results of this seemingly exhaustive routine survey have been so productive that the general diagnostic clinic seriously considers carrying out x-ray examinations of the gastro-intestinal tract in all patients receiving a physical examination, that is, people over forty. Since this plan is manifestly impracticable, a compromise has to be effected. The stools of all patients are tested for occult blood. Of course, you must rule out whether they have been having meat in the last day or two before these are taken. When positive, these patients receive a complete gastro-intestinal x-ray and investigation. We are not yet in a position to assess the value of this course, but it may be predicted, with certainty, that it is a forward step in the early diagnosis of gastro-intestinal malignancy.

As mentioned before, the mortality of gastric resection for cancer has fallen, during the decade, from a high figure of 20 to 30 per cent to a low of 5 or 8 per cent. This improvement is all the more significant when it is pointed out that, during the same period, the scope of the operation has increased. Patients who ten years ago were being denied operation now are given the benefit of resection. It cannot be claimed that the life-span is lengthened for many of these patients, but at least the patient is given a chance to have his life prolonged. Occasionally, the surgeon is rewarded with a three- or four-year survival in what seemed to be a perfectly hopeless case. This occurs with sufficient frequency to encourage him to persist in an otherwise apparently hopeless field of endeavor, for the vast majority of these borderline cases live less than six months following resection. However, it can be said that their few remaining months of life are more tolerable, since removal of the fungating growth from the stomach relieves the accompanying gastritis and anemia. Relief from nausea and anorexia leads to an increased intake of food, and some patients actually gain in weight.

This reduction in operative mortality can be attributed to an increased realization of the importance of adequate preoperative preparation, and this, we think, is extremely important. Restoration of the water and electrolyte balance, correction of anemia, administration of the vitamin B complex to stimulate the appetite for a high protein, high carbohydrate, low fat protection liver diet, are basic factors.

Wound and anastomotic healing, we feel, are aided by the administration of vitamin C, and in the case of the poorly nourished patient, intravenous amino-acids are also an aid. We do clean the stomach thoroughly, of course, before operation, sometimes using bicarbonate of soda to wash it out immediately before the operation.

The possibility of having to remove a portion of the transverse colon—and this doesn't happen too infrequently, because the growth has extended to the transverse colon—should always be considered, and for that reason the colon, too, should be prepared, in case it might

have to be removed. In preparing it we use succinyl sulfathiazole, 4 gm., four times daily, for four days before operation; at the same time we see that the patient has adequate water intake because drug fever is far less apt to occur if the patient has dilution with the fluids which he is taking.

The final step, and a very important one, is the provision for blood transfusions. (One reason, I feel, that more radical resections of the stomach were not done while we were students is that we did not have the use of blood transfusion.) Before any operation, we must always be sure that we have adequate amounts of proper blood, and we even give it during operations.

Some of the operations now performed for gastric cancer are too limited in their scope to be designated as radical procedures. An adequate operation for cancer in any location implies removal of the growth and a generous margin of healthy tissue, together with as much of the lymph drainage, vessels, and nodes as is practical, because we do know that it spreads through the lymph vessels. Many partial gastrectomies for cancer fall short of this goal by failure to remove all of the great omentum, and by failure to ligate the right gastric epiploic artery and the left gastric artery at their sources of origin.

ANOTHER great factor in lowering the mortality rate and the deaths following operation is anesthesia. In our earlier days we gave ether anesthesia. We scarcely ever use ether anesthesia today for the purpose of gastrectomy. We use spinal anesthesia, continuous, and often with curare, to provide better relaxation. I may say that Dr. Balfour, when I saw him over thirty years ago, was using spinal anesthesia.

We prefer spinal anesthesia, using either fractional novocaine or nupercaine, 1:1500 solution, administered by the Jones' technic. This maintains perfect relaxation and is definitely the anesthetic of choice, provided there is no contraindication to its use. In the very poor risk patient, we use local anesthesia.

I was in Rome, Italy, just before the war and was entertained by Dr. Raffaele Bastionelli. He took me out to his private hospital and did two gastrectomies for cancer with the Polya technic. He was thoroughly impressed by that method of doing the operation. He did not have doctors helping him, and he did not have an anesthetist. He sat on a high stool and the patient was carefully prepared by the nurse. He himself injected a local anesthetic throughout the abdominal wall, and after he made his incision, retroperitoneally, he did two very beautiful operations, all by himself, without what we regard as necessary assistance. One great thing that was lacking in that type of surgery was the fact that he was failing to train men, which we feel today is such an important part of our duty.

We use local block or infiltration with 0.5 per cent novocaine solution, supplemented by inhalation of gas, which is either ethylene or cyclopropane, or intravenous anesthesia in our very poor risk patients.

I feel that there is not any great need of going into the operative technic. It has gradually developed, and I think each surgeon develops his own deviations from the Billroth I or the Billroth II or the Polya or the Finsterer operation. A great number of operations have been devised. We personally like our own modification of the Finsterer type of operation. We emphasize removal of the gland-bearing lymphatic drainage areas, and we always take off the great omentum, which strips so easily from the transverse colon. We lay great emphasis on ligation of the right gastro-epiploic artery and the left gastric artery at their sources. The duodenum is carefully dissected free. Everything depends on freeing of these tissues, so they can be easily brought up into the wound. Thirty-five years ago I saw Donald Balfour bring all these structures completely outside the abdominal wound in a manner that I had never seen before. It made the operation easy.

We recently had a patient in whom the cancer was very small, perhaps not larger than the tip of the finger, but there were glands

along the lesser curvature which extended up the whole esophagus. Dr. Graham did a most complete operation on this patient, but even the topmost gland, when examined in the pathological laboratory, showed involvement of cancer. That patient lived eighteen months, and a very worth-while eighteen months.

Ordinarily you would think, "We have gotten this cancer very early and this patient will be cured." It is not the size of the cancer alone. I recently saw a patient, a general in the Army, upon whom I had operated six years ago. He had a mass much larger than my single fist in his stomach, a fungating cancer. When he came to us, he had marked anemia and all the signs that we were taught by Osler as diagnostic—loss of weight, a mass in the abdomen, blood in the stools, inability to eat, etc. We thought it probably was a hopeless cancer, but I saw him yesterday and there was no sign whatever of recurrence. His health has been excellent. He is seventy-seven years old and I do not believe that he will die of cancer.

I just want to say, in conclusion, that we emphasize that the stomach is the most susceptible organ in the body to the development of cancer. Always bear this in mind. Napoleon used to brag that he had a stomach of iron, that he could eat anything or drink anything, and that he never had any symptoms whatever from stomach trouble, but you all know what a terrible death Napoleon had on St. Helena from cancer of the stomach. Perhaps poetic justice. Fortunately, very good reports of the autopsy are still available.

In consideration of the history, bear in mind that, regardless of age, the fact that a patient has never had any gastric symptoms until maybe two or three or four weeks before you see him does not mean that he has such perfect digestion that he is not subject to this terrible disease. But now it is not so terrible as it used to be, for the operability has steadily increased, and the mortality rate has just as steadily decreased during the past ten years.

As a result of experience gained by occasionally taking over my father's general practice, I sometimes wonder what the problem really is in the United States. I know from experience the position of the country practitioner. How is he going to determine early whether that patient has cancer of the stomach? He cannot do it himself; often he has no equipment for gastric analysis. He does have means, we hope, for blood examinations and for determining whether the patient has blood in the stool. He must make sure that the patient has not been eating meat perhaps for two days before the test; otherwise he will obtain a false positive guaiac test. He must have available some place within the means of the patient and himself to get that patient where proper x-rays and interpretation by experts are available. That may be the problem with which we are all faced in the United States. Improved survival rates after adequate surgical intervention can be attained, as I said before, only by earlier recognition of the disease.

I wish to express keen appreciation to my associate, Dr. Laurence S. Fallis, for aid in preparing this clinic, and also for keeping us up to date with every advance along this line.

DIAGNOSTIC CLINIC

Brain Tumors

W. JAMES GARDNER*

THE CLEVELAND CLINIC, CLEVELAND

THE FIRST patient is a woman forty-three years old, complaining of unsteadiness in walking, numbness and weakness of the left side of her face, deafness in the left ear, headache, vomiting, and failing vision. The first symptom that she noticed was weakness and numbness of the left side of the face three years ago, and since that time she has been subject to headaches with increasing frequency. There has been a progressive loss of hearing in the left ear for two years. For one year she has noticed a lightheadedness that has progressed to the point where it is now very difficult for her to walk. There has been a progressive failure of vision for three months, vomiting for the past two months, choking on drinking water for the past few weeks, and failure of memory of indeterminate duration.

On examination there is pronounced choking of the optic disks in both eyes, nystagmus on lateral gaze, weakness of the left abducens muscle causing the left eye to turn inward, impaired sensation on the left side of the face with left facial paralysis, and loss of hearing in the left ear.

The gag reflex is absent bilaterally and the sensation of the pharynx is markedly diminished. There is absence of the sense of taste on the posterior third of the tongue on the left side. The patient is extremely ataxic, more markedly so in the left arm and the left leg.

Audiometer tests show that the hearing in the right ear is normal, whereas in the left ear it is almost absent. The Bárány test was performed; the ear canals were irrigated with cold water, 68°F. This produced no response when the left ear was irrigated; when the right ear was irrigated nystagmus and a sensation of dizziness occurred.

The spinal fluid pressure was markedly increased; it measured 400 mm. of water. The removal of only 4.5 cc. of spinal fluid reduced this pressure from 400 mm. of water to 160 mm. of water. The protein content of the spinal fluid was 51 mg. per 100 cc. X-rays of the skull disclosed no abnormality.

From the clinical picture in this case there is no question but that this patient has a tumor of the cerebellopontine angle, a tumor, that is,

*Department of Neurological Surgery, Cleveland Clinic, Cleveland, Ohio.

NOTE: Presented before the meeting of the Interstate Postgraduate Medical Association of North America, Cleveland, Ohio, October 15 to 18, 1946.

on the left lateral surface of the pons between the pons and the cerebellum. The most common tumor in this location is a neurofibroma of the acoustic nerve. I am inclined to doubt that that is the type of tumor which this patient has because, first of all, the loss of hearing was not the first symptom. If the tumor originates on the eighth nerve, the first symptom is usually tinnitus and progressive deafness. In the case of this patient it was numbness and weakness of the left side of the face. Furthermore, in the typical acoustic neurofibroma, which constitutes perhaps 7 to 10 per cent of all intracranial neoplasms, the protein content of the spinal fluid is invariably elevated, usually to a considerable degree. In this case the protein content is only 51 mg.

Other neoplasms that occur in this area are meningioma, a tumor originating from the dura mater, and, more rarely, a tumor called a chordoma, originating from remnants of the primitive notochord in the basilar bone. That is the tumor which is most apt to occur in this area and not cause an increase in the protein content.

In a patient with a typical acoustic tumor, a careful chronological history will usually establish the diagnosis. As these tumors originate on the sheath of the eighth nerve, the first symptom is tinnitus followed by increasing deafness. Sometimes there is a period of mild vertigo at the onset, due to irritation of the vestibular portion of the eighth nerve. The eighth nerve is really two nerves, the auditory nerve (the nerve of hearing) and the vestibular nerve (the nerve of equilibrium).

The next symptom after the deafness is usually a mild unsteadiness in gait which progresses slowly to a marked cerebellar ataxia. During this time, headache and progressive cranial nerve palsies make their appearance. The headache is more commonly in the back of the head and may be confined to the side on which the tumor is located. As the headache becomes more severe it is accompanied, of course, by forceful vomiting, double vision, failing vision, and staggering toward the affected side.

W. JAMES GARDNER

WHAT symptoms should make one suspect the possibility of an intracranial tumor? The most common clinical evidence of tumor of the brain is a history indicating a slowly progressing lesion of the brain. A hemiplegia, for instance, may be due to an intracranial tumor but it is more commonly due to a stroke; however, if a patient has a hemiplegia which began with a slight awkwardness or difficulty in using one extremity and then progressed steadily over a period of weeks or months, one should think first of the possibility of a neoplasm of the brain. A steady march of cerebral symptoms progressing over a period of time with new signs being added but none disappearing is typical of this condition. If the patient is in the arteriosclerotic age group and the cerebral signs appear suddenly, the odds naturally favor cerebrovascular disease. If the patient is a young woman and the neurological signs appear and then disappear, multiple sclerosis must be considered. One should remember that the patient with multiple sclerosis seldom has pain, never has convulsions, and

does not feel sick. Such patients commonly say, when they walk into your office, "I am not a bit sick but I just can't walk straight."

If the cerebral signs are accompanied by fever, one must, of course, consider encephalitis, meningitis, and brain abscess. The mental symptoms commonly encountered in intracranial tumor are impairment of the memory, changes in the personality, and a progressive blunting of the intellect. Actual psychotic states are very rare. About 75 per cent of patients with brain tumor, by the time their symptoms impel them to seek medical help, have developed increased intracranial pressure. These symptoms, as I have mentioned, are headache, vomiting, which is frequently projectile and unassociated with nausea and, at a later stage, failing of vision. Vomiting is more common in children than in adults and may not be accompanied by headache.

The exact physiological mechanism of the vomiting and increased intracranial pressure have not been adequately explained. The loss of visual acuity when due to an intracranial tumor is invariably accompanied by either edema of the optic nerves or by atrophy of the optic nerves. An intracranial tumor cannot reduce the visual acuity if the optic nerve is normal in appearance. It may cause a homonymous field defect in the presence of a normal-appearing optic disk but not a loss of the acuity of vision.

The visual loss in brain tumors progresses slowly. The patient who has a rapid failure of vision over a period of a few days, with a papilledema but no headache, has optic neuritis and no brain tumor.

Aside from the evidence of increased intracranial pressure one should be suspicious of the possibility of a cerebral neoplasm in any patient who exhibits a progressive blunting of the intellect or any type of progressive diminution of brain function. Brain tumor should be considered as a first possibility in a case of any person over thirty years old who develops convulsions, and particularly is this the case if the convulsions affect one side of the body and if they are followed by temporary paresis of the limbs on that side. The rapidity of the progress has not been adequately explained. The loss of an indication of the rapidity of the growth and therefore an indication of the degree of its malignancy.

A study of the fields of vision of patients with intracranial tumor is very important in determining the location of the growth. A right homonymous hemianopsia or loss of vision in the right half of each visual field means without exception that the lesion is in the left temporal or left occipital lobe, and vice versa. It is not necessary to send the patient to an eye physician to have a perimetry done in order to determine whether he has a homonymous hemianopsia, for the demonstration of a homonymous hemianopsia is a very simple procedure. You stand directly in front of the patient and tell him to look right at your nose and then simply wave your hands and ask, "How many hands do you see?" If the patient has a homonymous hemianopsia, he will say one and will see the hand only on the side in which there is no visual loss. Many patients with hemiplegia have a blindness in the field of vision on the side of the paralysis, which can be very easily demonstrated in that manner. A patient with homonymous hemianopsia will often, in going through a doorway, bump the doorjamb on the side of his blindness, and if you look at the front fenders of his automobile, you are very apt to find that one of them is crumpled—he has trouble backing out of the garage.

Another type of visual loss is a bitemporal hemianopsia, that is, a blindness in the temporal field of each eye. The patient can see straight ahead and on the nasal side, but both temporal fields are out. This can be produced only by a lesion that presses on the optic chiasm. If a patient has a bitemporal hemianopsia, the lesion is always a surgical one because this type of field defect is never produced by a stroke, encephalitis, or other nonsurgical conditions, as may be the case with a homonymous field defect.

The common types of intracranial tumor in

order of their frequency are the gliomas, the meningiomas, tumors of the acoustic nerve, pituitary tumors, and metastatic carcinomas. Strictly speaking, the glioma is the only true brain tumor, that is, it is the only tumor that arises from the brain tissue proper. Meningiomas arise from the membranes covering the brain; pituitary tumors arise from the epithelial cells of the anterior lobe of the pituitary gland; acoustic tumors arise from the sheath of the eighth nerve.

In adult life the glioma of the cerebral hemisphere is encountered more frequently than any other single type of tumor. Gliomas vary in malignancy from the rapidly growing glioblastoma to the slowly growing, benign oligoglioma.

A FAIRLY typical case history of the malignant type follows: A healthy, active man of fifty begins to complain of headache. He takes some aspirin and ignores the headache for a few weeks, but it increases in frequency and severity so that he stays home from work. It is then noted by his family that his memory is impaired and that he is occasionally mildly confused. The symptoms daily increase in severity and new ones appear. There is numbness or weakness of one side of the body and blurring of the vision. The patient as a rule seeks medical help about two months after the appearance of the initial symptom. At this time he is found to be lethargic and confused and complains of headache. He has weakness of one side of the body with exaggeration of the tendon reflex. An ophthalmoscopic examination reveals swelling of the optic disks with some retinal hemorrhages.

This clinical picture favors a rapidly growing glioma, probably a glioblastoma, and this is the type of neoplasm which has gained for brain tumors a most unenviable reputation. It represents about 12 per cent of all intracranial tumors.

The oligoglioma is at the other end of the scale as far as malignancy is concerned. This tumor may cause symptoms for ten years or more before the diagnosis becomes apparent. The initial symptom is most frequently a convulsion, usually jacksonian. At first the convulsions recur at long intervals, perhaps years, but steadily increase in frequency and are accompanied by gradually increasing weakness and spasticity of the extremities which are affected by the seizures. Between the glioblastoma on the one hand and this benign oligoglioma on the other there are various types of gliomas of varying degrees of malignancy and with less clear-cut clinical pictures.

The meningioma is a benign encapsulated growth which occurs in the meninges; it compresses but does not invade the brain. It occurs most commonly during the fourth and fifth decades of life and is rare prior to the third. Because it does not invade the brain it lends itself more frequently to a permanent cure by removal than does the glioma.

Although a preoperative diagnosis of meningioma is not always possible, there are, nevertheless, certain findings in the majority of cases which make the diagnosis likely. These tumors grow slowly, and the symptoms date back many months or years. In about one-third of the cases the initial symptom is a convulsion. There is sometimes a swelling of the scalp over the site of the tumor, and an x-ray examination of the skull will give localizing evidence in at least one-fourth of the cases.

However, the point upon which the differential diagnosis most frequently hinges is the occurrence of a slowly growing tumor in a location known to be the favorite site of the meningioma. The most common location is along the sagittal sinus, that is, along the vertex of the skull; it is frequently accompanied by swelling of the bone and of the scalp, which is visible or palpable. The next most common location is on the sphenoid ridge in the temporal region, in which case it may cause a unilateral exophthalmos. Another frequent site is in the olfactory grooves at the base of the skull in the anterior fossa. The earliest symptom in this location is loss of sense of smell.

Tumors of the pituitary gland occur most commonly between the ages of twenty and

forty. In a woman, the first evidence of a pituitary tumor is amenorrhea; in a male, the first symptom is apt to be loss of sexual potency, but the symptom that brings the patients to the physician is loss of vision, and this is always due to atrophy of the optic nerve. The patient with a pituitary tumor does not have papilledema because the tumor arises between the optic nerves, compresses them, and causes atrophy. There is serious visual loss from direct pressure on the optic nerve before the tumor attains sufficient size to increase the intracranial pressure generally. Clinically, the symptoms of pituitary tumor may be divided into the endocrine signs, which appear early, and the pressure signs, such as headache and failing vision, which appear later.

There are two chief varieties of pituitary tumor. The chromophobe variety is accompanied by the hypopituitary signs, such as diminution of libido, moderate obesity, amenorrhea in the female, and diminution of hair on the body and face of the male. Usually there is a subnormal metabolic rate and an increase in the glucose tolerance curve. In the acidophilic variety the patient presents the striking picture of acromegaly—the features are large and coarse, the hands and feet are thick, there is spacing of the teeth. With this type of tumor there is frequently an increased metabolism, an elevated blood pressure, and diabetes mellitus. The characteristic finding in the visual field in either case is bitemporal hemianopsia, that is, a loss of vision in the temporal field of each eye. It is just as if the patient had on blinders such as we used to see on horses. One should remember to make an x-ray of the skull in any woman with an unexplained amenorrhea, because if this condition is due to a pituitary tumor the distention of the sella turcica shown on the x-ray film will be unmistakable.

About 5 per cent of intracranial tumors are metastatic, and the most common site is carcinoma of the bronchus. The original lesion in the lung may be asymptomatic. Therefore, every person of middle age with symptoms of a rapidly growing intracranial tumor, should have an x-ray of the chest. If this discloses a tumor of the lung, it is safe to assume that the intracranial lesion is metastatic.

Metastatic tumors of the brain are apt to be multiple, and the neurological signs, therefore, are vague and conflicting. Headache is invariably severe and the symptoms rapidly progressive. The protein content of the spinal fluid in cases of metastatic malignancy is nearly always increased. A negative chest x-ray, however, does not exclude carcinoma of the bronchus, as we all know. The metastatic lesion in the brain may be very large and the primary lesion in the bronchus may not be detectable until necropsy.

So much for brain tumors in adults. I want to consider briefly brain tumors in childhood. Usually the symptoms of increased intracranial pressure in children occur before there are any focal signs to suggest the location of the lesion. Recurring attacks of headache and vomiting are the rule. These occur at intervals of days or weeks with completely symptom-free periods. Recurring bouts of sudden vomiting without headache are very common. The physician's attention, therefore, may be centered on the gastro-intestinal tract for months or until serious visual disturbance points the way to a correct diagnosis. The visual disturbance may be a double vision due to sixth nerve paralysis from the increased intracranial pressure, or this abducens paresis may progress to an obvious internal squint before the child complains of it. Failing vision may also reach the point where it is evident to the parents before the child is aware of it. The important thing to remember is to make a fundus examination in any child who is having attacks of headache and vomiting.

Another simple, though later, sign of increased intracranial pressure in childhood is Macewen's sign. This is a cracked-pot sound which occurs on percussion of the skull. If you simply thump the skull of the child with your middle finger you will elicit a sound like that of a cracked pot. This is due to separation of the cranial sutures; it is quite striking and easily elicited.

The most common tumor in childhood is a glioma of the cerebellum. These tumors are always located in the midline between the two cerebellar lobes and are of two varieties. The cystic astrocytoma is the most benign of the gliomas and yields brilliantly to surgery. The other type, known as the medulloblastoma, is composed of highly undifferentiated cells. It cannot be completely excised, but it responds better to x-ray therapy than any other intracranial growth.

These tumors, because of the midline position, soon obstruct the flow of cerebrospinal fluid from the ventricle and thus cause an obstructive hydrocephalus. The localizing signs are frequently lacking or they may consist only of some instability in walking.

Another tumor encountered in childhood and adolescence is a tumor of the hypophyseal stalk, usually referred to as a craniopharyngioma or Rathke's pouch cyst. This tumor arises just above or within the sella turcica from embryonal cell remnants left by the outpouching from the primitive nasopharynx which grew to form the anterior lobe of the pituitary gland. Because of pressure on this gland, these tumors usually produce signs of pituitary hypofunction. These children, therefore, are apt to be chubby and dwarfed, with signs of puberty lacking. Because of their cystic nature and their slow growth, the resulting loss of vision appears later and progresses very gradually, and this, in spite of their close proximity to the optic nerves and chiasm. When the cyst attains sufficient size to compress the third ventricle and thus produce an obstructive hydrocephalus, the symptoms of increased intracranial pressure supervene, with rapid loss of the remaining vision.

Gliomas of the cerebral hemisphere occur in children but they do not produce the syndrome as characteristically as those previously described. Meningiomas and neurofibromas rarely occur before the age of maturity.

ANTIVIVISECTIONISTS HINDER RESEARCH

At a recent meeting of the American Foundation for High Blood Pressure, in Cleveland, an attack was planned on antivivisection legislation. This effort was stimulated by the difficulty that is being experienced in finding dogs with which to carry forward experiments.

Thousands of stray dogs are killed every year in pounds, but their unavailability to research workers is holding up teaching and research. This shortage of animals is caused by the antivivisectionists. They are organized against vivisection. The scientists are not organized in favor of vivisection. The antivivisectionists will continue to hound us—doggedly—unless we organize to defeat them.

DIAGNOSTIC CLINIC

Differentiation Between "Psychogenic Rheumatism" and True Rheumatic Disease

PHILIP S. HENCH*

UNIVERSITY OF MINNESOTA GRADUATE SCHOOL OF MEDICINE, ROCHESTER, MINN.

THE most common rheumatic diseases are (1) osteo-arthritis, a nuisance but not a calamity; (2) rheumatoid arthritis, the most crippling of the chronic arthritides; and (3) primary fibrositis, a periarticular or intramuscular condition which produces aching stiffness of joints or muscles but which produces no intra-articular disease. Patients with fibrositis might be called "rheumatic," but not "arthritic." "Psychogenic rheumatism," another common condition, (psychoneurosis affecting the musculoskeletal system) must be distinguished from the first three because, under certain circumstances, it may be mistaken for one of the other conditions.

To point out the differences in these four conditions, we have certain patients disabled thereby, patients made available to me through the courtesy of Dr. Charles S. Higley, Dr. Maxwell Harbin, and Dr. W. K. Massie.

OSTEO-ARTHRITIS

The first patient, Mrs. S., is sixty-eight years old. For ten years she has had a lumbar backache. Her roentgenograms show lumbar osteo-arthritis with a little thinning of the articular cartilages and the secondary formation of hypertrophic osteophytes. She presents no constitutional evidence of disease: the sedimentation rate is normal and there is no secondary anemia.

Her hips are also affected by osteo-arthritis, hence she walks with a cane. Aside from this fact, her physical condition looks grossly normal. There are no swollen joints and she can lean over very well.

The diagnosis in this case, osteo-arthritis, is based largely on the roentgenographic abnormalities. Osteo-arthritis commonly affects not only the lumbar spine and hips but also the hands and the cervical spine.

To understand the visible and roentgenographic changes that take place in this disease, we must know something of its pathology. By the time human cartilage has become fifty years of age it has generally begun to wear and tear and fray; in other words, to degenerate. For instance, a roentgenogram will show that, above the subchondral bone, the cartilage is fraying, showing signs of wear and tear. Sometimes the cartilage degenerates all the way through to the underlying subchondral bone.

*Associate Professor of Medicine, University of Minnesota Graduate School of Medicine, Rochester, Minnesota.

NOTE: Presented before the meeting of the Interstate Postgraduate Medical Association of North America, Cleveland, Ohio, October 15 to 18, 1946.

In that case the underlying bone thickens and becomes hard and smooth; this process is called "eburnation of bone." We can see all these changes in roentgenograms if we know how to interpret them.

The "joint space," the space between the two opposing osseous shadows in roentgenograms, is actually not an empty space; most of the "space" is where the cartilage is; cartilage does not impede roentgen rays; hence its presence in roentgenograms is revealed merely by the space it takes. Thus, on a roentgenogram of the hands of a person with osteo-arthritis one can see the thinning of certain "joint spaces." Those of the affected finger joints will not be nearly as wide as those of the normal joints. This thinning of the interosseous spaces simply means that the cartilage has become thinned. In such a roentgenogram you may be able to see that the margin of the underlying bone looks whiter and more dense than normal: this might suggest eburnation. You may also notice that there is no atrophy or lack of density (thinning) of the epiphyseal bone. However, there may be some irregularity of the margins of the subchondral bone, due to osseous overgrowth (lipping) and some destruction.

Osteo-arthritis, then, is a composite of (1) degenerative chondritis, (2) hypertrophic and destructive (more hypertrophic than destructive) osteitis of subchondral bone, and also (3) secondary fibrositis, generally of a mild degree and characterized by aching stiffness of the musculofibrous tissues.

This is an aging process. The cartilages degenerate; the underlying bone reacts thereto. Also the muscles and the fibrous capsule of joints lose their resiliency to a certain degree, a process called "secondary fibrositis." The latter does not produce significant muscular spasms or atrophy or flexion deformities; in these ways it differs notably from the secondary fibrositis of rheumatoid arthritis. Most important of all, the synovial membrane is not significantly affected in osteo-arthritis; it does not proliferate or produce hydrops or pannus. Hence, in uncomplicated osteo-arthritis we do not see boggy hydropic swellings, flexion deformities, or fibrous or bony ankylosis. Since, as a rule, there is no systemic disease we note no constitutional or humoral reactions: no elevation of sedimentation rates, no anemia, no loss of appetite and weight. The absence of these features is important and helpful in diagnosis.

PHILIP S. HENCH

RHEUMATOID ARTHRITIS

The next patient, Mrs. F., is more disabled than the first. For two years she has had "chronic rheumatism" with aching in many joints and swelling of the finger joints. The fusiform swellings of her phalangeal joints, so characteristic of rheumatoid arthritis, are visible. In addition to the articular lesions she has evidence of constitutional reactions: an elevated sedimentation rate and an erythrocyte count of 3,500,000 per cubic millimeter.

Fusiform swelling of joints in this disease results chiefly from involvement of synovial membrane, in lesser part from juxta-articular muscular atrophy. The inflamed synovial membrane becomes thickened and "proliferates"

with the formation of villi. A striking feature of the inflammatory reaction in the inflamed synovia is the presence of circumscribed collections of round cells. Similar collections appear in the epiphyseal bone of affected joints, and the associated inflammatory hyperemia therein produces in time some atrophy of epiphyseal bones. As the disease progresses, the affected synovial membrane sends out a tongue or pannus of inflammatory tissue that extends first over the surface of the articular cartilage; later fingers of this pannus extend down into and invade the cartilage, which may eventually be destroyed. Furthermore, the pannus serves as a plastering membrane between the opposing surfaces of the joint which may lead first to a fibrous and later to an osseous ankylosis.

In the roentgenogram of one of Mrs. F.'s joints, there can be seen periarticular cloudiness due to synovial thickening and effusion. The inflammatory hyperemic reaction in epiphyseal (subchondral) bone has already produced some osseous atrophy (decalcification). Some of the articular "spaces" are thinned; some, practically gone, indicating varying degrees of destruction of cartilage.

In the "secondary fibrositis" or fibromyositis of rheumatoid arthritis there are actual regions of inflammation in muscles, in consequence of which muscular spasms, atrophy, and flexion deformities may occur, features which do not occur in connection with the secondary fibrositis of osteo-arthritis.

THUS it will be seen that rheumatoid arthritis is a much more widespread disease than is osteo-arthritis. Rheumatoid arthritis is a composite of (1) a proliferating synovitis, (2) an atrophic nonsuppurative epiphyseal (subchondral) osteomyelitis, (3) a destructive chondritis (from inflammation, not degeneration), (4) a subchondral osteitis which is more destructive than hypertrophic (in contrast to the osteitis of osteo-arthritis which is more hypertrophic than destructive), (5) a secondary periarticular and intramuscular fibrositis, and (6) systemic disease. The presence of the last condition is important and helpful in differential diagnosis: the constitutional and humoral abnormalities indicative of this systemic disease are often present very early in the course of the disease. The sedimentation rate is increased in about 90 per cent of cases; the patient usually has a hypochromic anemia with a moderate reduction in hemoglobin and erythrocyte count and some loss in weight and appetite. The diagnosis in rheumatoid arthritis is based primarily on the objective findings (a relatively afebrile polyarthritis with early articular swellings); the constitutional reactions occur fairly early, and, in due time, the roentgenographic abnormalities are visible.

PRIMARY FIBROSITIS

Our third patient, Mrs. H., has experienced aching pains of a characteristic type in muscles of the neck, shoulders, and chest, and recently, aching in the finger joints. These symptoms have recurred on and off for several years; at this time they have been present for about three weeks. Her sedimentation rate is normal. Roentgenograms reveal nothing to account for the symptoms.

The diagnosis in this case is primary periarticular and intramuscular fibrositis, primary because it is apparently an independent, idiopathic condition, not related to the presence of any rheumatoid, osteo-arthritis, or other type of arthritis. If you wish, you may prefer to call it myositis or muscular rheumatism, as far as the muscles are concerned. But where the joints are concerned, it is a capsular or periarticular affair with no evidence of intra-articular disease, hence not an arthritis, and in the articular locations not a myositis.

This case of Mrs. H. resembles that of a man who came to us complaining of aching and stiffness in hands and knees, recurrent for eight years. There has never been definite swelling and there were no deformities. The aching stiffness was generally worse in the morning and symptoms increased with damp, cold weather. He could always move his knees through a full range of motion even though they were stiff and sore.

From time to time he had been told he had "arthritis." When no objective abnormalities appeared, certain physicians withdrew that diagnosis. Still afraid that he did have arthritis, he came to us with two questions: "Do I or do I not have arthritis, and will I or will I not become disabled?"

The first question we asked ourselves was, "Does he have any intra-articular disease?" There was no articular effusion and he never had noted any swelling. There was no palpable bogginess or thickening to suggest synovial proliferation. Roentgenograms revealed no thinning of articular spaces, hence no demonstrable cartilaginous involvement. There was no decalcification or atrophy of subchondral epiphyseal bone—no evidence of any inflammatory hyperemic reaction therein even after eight years of symptoms. Therefore, we concluded that there was no evidence of intra-articular disease. There were no systemic manifestations, no anemia, and no loss of weight, and the sedimentation rates were normal.

In this particular case we made an articular biopsy of a knee: the cartilage and synovia appeared normal objectively, and synovial tissues were normal microscopically. Therefore, we told the patient that our diagnosis was periarticular fibrositis, not arthritis.

CRITERIA FOR A DIAGNOSIS OF ARTHRITIS

In trying to explain to him this condition and its distinction from arthritis, we used an analogy, likening arthritis to a fire in a house. When there is a fire in a house there is not only smoke but also flames. A civic reaction occurs —excitement, crowds, the fire engines. The firemen throw water on the fire so you have too much water around. There is some loss of function as far as the house is concerned, and when the fire is out one notes damage of some degree. These things are all part and parcel of a fire.

Now arthritis is a "fire" in a joint. You not only have subjective symptoms of pain and stiffness—"smoke"; you also have "flames"—inflammation, swelling, tenderness, sometimes redness; and you may have excess "water" in the joints, analogous to the water at a fire. Analogous to the civic reaction, the arthritic may demonstrate a constitutional reaction, as I have described. Some loss of articular function and damage of some degree occurs. The latter may be little or much and will show up objectively and roentgenographically in due time.

Thus, if you are going to make a diagnosis of arthritis, you must have something besides "smoke"—merely subjective symptoms. You must have something more definite to go on. Criteria for a diagnosis of arthritis must be as definite as those for a diagnosis of pulmonary tuberculosis. To make the latter diagnosis one must find something more than a cough. So also to make a diagnosis of arthritis one must demonstrate something more than just aches and pains. If only the latter are present one should not (yet) make a diagnosis of arthritis. If in an unusual case, all these criteria are absent in the first weeks of a developing rheumatoid arthritis, you should not call it arthritis until definite evidence thereof is present, even though one's first diagnosis (probably of periarticular fibrositis) is "wrong" in this indefinite stage.

The conclusion of all this is that to make a definite diagnosis of rheumatoid or of osteoarthritis (or of any other type) you must have one or two or three of the following: (1) physical signs such as the definite swellings in Mrs. F.'s case of rheumatoid arthritis or the osseous nodular enlargements of Heberden's nodes in a case of osteo-arthritis; (2) constitutional reactions; (3) roentgenographic changes. As for "swellings," you must not take the patient's words; you must verify them.

PSYCHOGENIC RHEUMATISM

Dr. Massie, is the fourth patient here yet? Did she come after all? Apparently not. Yesterday morning she promised to come but last night she telephoned Dr. Massie that she was just too sick to come down here. She told him, "I can't face it." I don't know whether she couldn't face me or couldn't face you! Anyhow

it is obvious that she hasn't been able to face it, whatever "it" is.

It is highly significant that she is represented here on the platform by an empty chair. The little woman who isn't here is fifty-two years old. For a long time she has had "rheumatism," chiefly in the back, "very severely," for eight years. Her skeletal pains have hopped around but their "headquarters" seem to have been in the back. Roentgenograms show a mild osteo-arthritis of the spine, as one would expect in a woman of fifty-two years, but it is mild and certainly not enough to explain her widespread and marked symptoms.

I am told that in addition to the "rheumatism" she has many other complaints. Every time she has gone to the clinic during the last eight years she has had a new set of complaints: indigestion, pains in the chest, "pains in her gallbladder" and so on and so on. No treatments have ever given her relief. The internists and psychiatrists have never found any organic disease to account for her complaints and they have made a diagnosis of marked psychoneurosis. As I have said, it is characteristic that this lady who has less evidence of organic disease than any of these patients on the platform is the one who couldn't get here.

WE ARE familiar with psychoneurosis as it affects the central nervous system, the respiratory, cardiovascular, or gastrointestinal systems, but physicians are not so familiar with psychoneurosis as it affects the musculoskeletal system. Psychogenic rheumatism is the musculoskeletal expression of functional disorders, tension states, or psychoneuroses, equivalent to the functional symptoms referred to other systems. Psychogenic rheumatism is one of the commonest causes of aches and pains in muscles, joints, or both.

During the war, at the Army's two centers for chronic rheumatism, about 15 per cent of all of our so-called "rheumatic patients" had psychogenic rheumatism, generally with no evidence of significant organic disease. In some cases, psychogenic rheumatism was present as a marked functional overlay of some rheumatic disease such as fibrositis or rheumatoid arthritis.

In most cases of psychogenic rheumatism there are only a collection of subjective symptoms without objective manifestations, but at times you actually see objective manifestations. In the Army such cases were rather numerous. For instance there was a young lieutenant who had what had been called a rheumatic flexion deformity of a hand. Actually it was not. It was a conversion mechanism, a hysteric flexion. After psychiatric treatment it disappeared.

Another example of psychogenic rheumatism was the case of a man with a hysterically bent, painfully stiff knee which under psychiatric treatment cleared up. The symptoms were not those of periarticular fibrositis.

One patient had "hysterical bent back" or camptocormia. The condition had nothing to do with this man's bravery or integrity. He was a captain who had three rows of ribbons, some of them for valor, yet he finally developed this hysterically bent back, a subconscious attempt at self-preservation.

Some of our soldiers with psychogenic rheumatism had aching pains in the muscles and joints of the arms, especially when their arms hung down. They were partially relieved of pain by holding their hands in an upright position or folding them across the chest in a sort of "position of piety" or a modified "September Morn" posture.

DIFFERENTIATION BETWEEN PSYCHOGENIC RHEUMATISM AND FIBROSITIS

Most of the victims of psychogenic rheumatism in civilian life do not have objective changes, merely subjective complaints. Because of the absence of objective signs and of constitutional or roentgenographic reactions, such instances of psychogenic rheumatism can be rather readily distinguished from rheumatoid or osteo-arthritis. But since the manifestations of fibrositis are also largely subjective, the distinction of psychogenic rheumatism from fibrositis is less easy and may require a detailed, minute analysis of symptoms. Recently, my col-

DIFFERENTIATION BETWEEN FIBROSITIS AND "PSYCHOGENIC RHEUMATISM"*

	FIBROSITIS, PRIMARY TYPE	"PSYCHOGENIC RHEUMATISM"
General attitude	Cooperative, earnest, "objective"	Tense, anxious, "subjective," defensive, antagonistic
Chief complaint	"Joints hurt and feel stiff"	"Can't quite describe it, doctor. It's like . . ."
Chief symptoms	Aching, soreness, stiffness, fatigue	Burning, tightness, weakness, numbness, tingling, queer or tired sensations
Time of day when symptoms are worse	Morning and/or late afternoon	Inconstant — often continuous day and night
Aggravation or amelioration dependent on:	External or physical environment	Internal or mental environment
Effect of mental preoccupation: (theatre, movie, bridge, etc.)	No definite relief, symptoms intrude	Often marked relief but perhaps "pays for it afterwards"
Symptom analysis		
1. Pain:		
Amount	+ to + +	+ to + + +
Constancy	Varies in intensity during day: worse in morning, better at noon, often worse again later in day	Tendency to be constant, "bad all the time"
Duration	Hours or days Remissions, exacerbations	Momentary or constant, "no different," getting worse
Location	Anatomical	Often not anatomical
Migration	May not migrate; if so migrates in anatomical fashion	Bizarre, hemalgia, etc.; may follow no anatomic pattern
2. Stiffness	Worse after much rest (jelling) More marked in early morning Better after mild exercise	Minimal or not present Jelling not characteristic
3. Fatigue	A.M. on waking, O to +; P.M. + +	Early A.M. + to + + + May be constant
	"Disability causes fatigue"	"Fatigue causes disability"
Effect of rest	After prolonged rest—worse (jelling)	Improvement or no effect
Effect of exercise	Better, "limbers up"	Worse during and after
Effect of applied heat	Temporary relief—hours	Variable—often worse
Effect of weather	Worse when cold and damp "Weather prophet"	Variable
Effect of therapy:		
In general	Temporary relief	"Nothing helps me, doctor"
Patient's attitude	Admits relief	Defies finding a cure
Aspirin	Temporary relief—hours	Usually no relief (aspirin futility), or "never tried it" (aspirin inutility)
Physical therapy	Temporary relief	Variable—often worse
Response to examination:	Cooperative; local tenderness consistent	Fearful, resistant; "touch me not" reaction
"Extras" (associated functional complaints)	O to +	+ to + + + + Bizarre limps and postures, headaches, globus hystericus, sighing respirations, precordial pains, insomnia, nervousness, tremor, etc.

*From Hench, P. S., and Boland, E. W.: The management of chronic arthritis and other rheumatic diseases among soldiers of the United States Army. Ann. Int. Med. 24:808-825. May, 1946.

league at the Army and Navy General Hospital, Major Edward Boland, and I tabulated the chief differences between the two conditions. (See Table).

The main difference may be summarized briefly. Fibrositis puts its victims at the mercy of changes of *external* environment; for better or worse, their symptoms are changed by

weather, heat, cold, rest, exercise, and so forth, whereas psychogenic rheumatism puts its victims at the mercy of changes of *internal* environment, and their symptoms will change and get better or worse depending on their mood or psyche, pleasure, excitement, worry, or fatigue.

FACTORS UNDERLYING PSYCHOGENIC RHEUMATISM

What are some of the basic difficulties which underlie the production of psychogenic rheumatism? In our group of soldiers, combat fatigue was one factor: certain soldiers, less stable than their fellows, reached the saturation point. They just "couldn't take any more." The subconscious demand for self-preservation went into operation with the development of musculoskeletal symptoms, a "flight into illness" to save the man's life or his mind. In other cases, the basic difficulties were maladjustment to discipline, to criticism, to a menial job, to the "indignities" and lack of privacy resultant from military herding, to homesickness, to loneliness, to worry over the illness or finances of the family, to worry over lack of promotion, to worry over the fidelity of wife or fiancée or perhaps over his own infidelity.

Let me cite some of the basic difficulties present in my latest 30 civilian cases. These difficulties were derived from or concerned the following: a stern parent interfering with a child's social development; an unattractive girl dominated by her protective mother and afraid the boys were passing her by; a person who previously was "imprisoned" by her parents and who considered herself "imprisoned" by her in-laws; a veteran forced by the housing shortage to live with in-laws (enough to give anyone psychoneurosis!); a common American trouble—"one vacation in ten years"; sexual impotence of the patient or the marital partner; June-December marriages; a spinster who had given up marriage to care for her mother whom she had thereafter unconsciously come to hate; fear of an unfaithful drunken husband; a patient whose relative had died of "rheumatism" and who feared that "rheumatism" might also be fatal to him.

Are not all these factors simply different kinds of fears and frustrations? The family physician, with his intimate knowledge of the personality and relationships of his patients, has a unique ability to spot such etiologic factors. To the extent that the general practitioner or internist or rheumatologist has a psychiatric approach he may be able to uncover the basic causes and try to help the patient to rectify them. But to discover and alleviate these causes with a large measure of success usually requires, sooner or later, the services of a psychiatrist.

"Rheumatism remedies" are of little or no avail except as they constitute mild (and generally inadequate) forms of psychotherapy. These miserable souls (and it is a matter of the soul or spirit more than of the soma) deserve something much more effective than tonsillectomy, heat, and aspirin. The results of psychiatric treatment are often most gratifying. But the first move in the direction of adequate treatment is the recognition by the physician and the acceptance by the patient that the latter has the condition, psychogenic rheumatism, which I have attempted to describe.

EDITORIALS

REHABILITATION THROUGH BETTER NUTRITION

At a time when more people are starving to death than ever before in the history of the world, it is important to note that progress is being made in the correction of nutritive failure and undernutrition. The term "nutritive failure" perhaps means different things to different physicians. It is now rather generally used to describe a variable clinical picture and does not have a specific connotation. It does not indicate why the nutrition has failed but simply that it has failed. Frequently the physician cannot determine at once the physiologic basis of the nutritional insufficiency, and by the use of this term he can describe briefly the clinical picture without knowing the precise causation.

For the sake of clarity, the various disturbances and mechanisms which create a picture of nutritive failure often are described separately. Pellagrous dermatitis or glossitis, beriberi neuritis or beriberi heart disease, scorbutic hemorrhages or gingivitis, cheilosis or the ocular symptoms of riboflavin deficiency often are seen as present symptoms arising as a response of the body to a long-continued deprivation of certain nutrients in food. Hence, nutritive failure is a more inclusive term than pellagra, beriberi, scurvy or riboflavin deficiency in that it connotes varying degrees of mixed deficiencies operating simultaneously.

Nutritive therapy has long been used in the fields of prevention and treatment, and it is important that it be used more and more extensively in the field of rehabilitation. A recent report on 893 persons with nutritive failure who were given adequate nutritive therapy indicates how effective such therapy can be in rehabilitation. By the application of the following four principles these persons were restored to health and resumed their former work or obtained work which enabled them to provide an adequate diet for themselves and frequently for other members of the family:

1. Conditions causing excessive requirements for nutrients must be removed or relieved whenever possible.

2. Symptomatic treatment and treatment for co-existing diseases must be given.

3. It must be made certain that the patient eats daily a diet which supplies 3000 to 4000 calories, 120 to 150 grams of protein, and liberal amounts of minerals and vitamins.

4. Therapeutic substances, such as dried brewers' yeast powder, liver extract, or vitamins in the form of synthetic substances, must be administered in sufficient amounts to correct the deficiency.

Physicians need education in the diagnosis and treatment of nutritive failure. Past experience has shown the impairment to health which occurs when nutritive failure is recognized late and treated haphazardly. People are beginning to seek medical opinion earlier for an explanation of the apparently trivial changes in body function and appearance, and the physician should learn the significance of these minor deviations from the normal and observe the course of events in order properly to diagnose and treat his patients. Clinical diagnostic methods are becoming more accurate, and every physician should be acquainted with them as well as with the most effective methods of therapy.

In examining his patients, the practicing physician should keep in mind that nutritional deficiencies occur rather frequently in the following groups of persons:

1. Those who are indigent.
2. Persons with histories of erroneous dietary habits or food idiosyncrasies.
3. Persons with organic disease or infections which may interfere with the ingestion or utilization of food.
4. Pregnant and lactating women and persons whose physical exercise is increased.
5. Persons who are chronically addicted to alcohol.

It has been pointed out that from conception to death man is beset by impediments to proper nutrition. The great problem in the rehabilitation of the undernourished is to replenish the tissues with the nutrients in which they gradually have become depleted. Too much stress cannot be placed on the fact that specific vitamins and minerals, as valuable as they are, cannot take the place of a liberal and well-balanced diet which supplies all the essential nutrients in needed amounts.

T.D.S.

NEW USES FOR CURARE

For years, curare stimulated the imagination of readers of pulp-thrillers and penny-terribles. Now it has captured the interest of physicians and anesthetists.

A recent issue of the *British Medical Journal* devoted four feature articles and an editorial to this drug. All of these articles consider the different, if not controversial, aspects of curarization. For example, most anesthetists and obstetricians would hesitate to curarize a mother, during delivery. The possibility of depressing the respiratory muscles of the infant is imminent; a child so affected may never draw its initial breath. However, Whitacre and Fisher, two years ago, reported that when properly employed, curare had no effect on the infant.

Gray, in the *British Medical Journal* mentioned above, confirmed their findings. He used curare in 30 cases of cesarean section, in conjunction with "kemithal" (cyclohexenyl-allylthiobarbiturate) and cyclopropane. The babies showed no evidence of any curarization; they cried lustily as soon as the head was delivered, and were unusually lively. Two exceptions:

INTERSTATE POSTGRADUATE MEDICAL ASSOCIATION OF NORTH AMERICA

OFFICERS OF THE ASSOCIATION

PRESIDENT
Dr. James E. Paullin, Atlanta, Ga.

PRESIDENT-ELECT
Dr. Herman L. Kretschmer, Chicago, Ill.

PRESIDENTS OF CLINICS
Dr. John F. Erdmann, New York, N. Y.
Dr. Frank H. Lahey, Boston, Mass.

MANAGING DIRECTOR
Dr. Arthur G. Sullivan, Madison, Wis.

SECRETARY
Dr. Tom B. Throckmorton, Des Moines, Ia.

TREASURER AND DIRECTOR OF FOUNDATION FUND
Dr. Henry G. Langworthy, Dubuque, Ia.

SPEAKER OF THE ASSEMBLY
Dr. Mather Pfeiffenberger, Alton, Ill.

BOARD OF TRUSTEES
Dr. Edwin S. Hamilton, Kankakee, Ill.
Dr. Mather Pfeiffenberger, Alton, Ill.
Dr. Maurice R. Williamson, Alton, Ill.
Dr. Henry G. Langworthy, Dubuque, Ia.
Dr. John E. O'Keefe, Waterloo, Ia.
Dr. Tom B. Throckmorton, Des Moines, Ia.
Dr. George V. I. Brown, Milwaukee, Wis.
Dr. John M. Dodd, Ashland, Wis.
Dr. Eugene S. Sullivan, Madison, Wis.

COMMITTEE ON MEDICAL RESEARCH AND ADVANCEMENT
Dr. Elliott P. Joslin, Boston, Mass.
Dr. W. Wayne Babcock, Philadelphia, Pa.
Dr. Charles H. Best, Toronto, Ont.
Dr. George Crile, Jr., Cleveland, Ohio.
Dr. Evarts A. Graham, St. Louis, Mo.
Dr. Roy D. McClure, Detroit, Mich.
Dr. Jonathan C. Meakins, Montreal, Quebec.
Dr. Eric Oldberg, Chicago, Ill.
Dr. James E. Paullin, Atlantic, Ga.
Dr. Erwin Schmidt, Madison, Wis.
Dr. Waltman Walters, Rochester, Minn.

PROGRAM COMMITTEE
Dr. Russell L. Cecil, New York, N. Y.
Dr. Henry A. Christian, Boston, Mass.
Dr. John R. Fraser, Montreal, Quebec.
Dr. Duncan A. L. Graham, Toronto, Ont.
Dr. Herman L. Kretschmer, Chicago, Ill.
Dr. Frank H. Lahey, Boston, Mass.
Dr. Charles F. Martin, Montreal, Quebec.
Dr. Charles W. Mayo, Rochester, Minn.
Dr. Howard C. Naffziger, San Francisco, Cal.
Dr. Charles H. Phifer, Chicago, Ill.
Dr. Leonard G. Rowntree, Philadelphia, Pa.

One infant in the series was sleepy, but he too was crying in five minutes; a premature baby weighing 3⅛ pounds delivered from an eclamptic mother, took six minutes to expand its lungs. Uterine tone was good, there was no long postoperative depression, and convalescence was peaceful and free of complications.

Interesting, too, is the use Ostlere has found for curare in the poor-risk patient. Although the drug has gained its fame by the manner in which it "subdues the robust," one can well appreciate that by reducing the quantity of anesthetic required, it might contribute greatly to the success of operative procedures in the aged or debilitated patient. This assumption led Ostlere to reserve his limited supplies of the drug for use in severe operations of 136 patients who were considered bad risks. Although eight of his patients in the series died, curare could not be implicated. After operation, the patients regained consciousness much sooner than ordinarily and recovery was more rapid. Ostlere believes that the greatest advantage of the drug is that it allows very ill patients, and particularly those needing thoracic surgery, to undergo operation without a dangerously prolonged deep anesthesia.

Two groups of investigators have studied the use of curare in electro-convulsion therapy. Gillis and Webster found that the drug minimized the convulsions. Although both curare and electro-convulsion therapy are respiratory depressants, these investigators found that no synergistic action appeared under the low dosage that was employed.

Hobson and Prescott used curare and pentothal sodium to modify electrical convulsions. In the dosages employed, the electrical convulsion threshold was not affected. Traumatic complications of the shock therapy were avoided, and there was no serious rise in blood pressure. For this reason, these drugs permit shock treatment of patients in whom otherwise it would be contraindicated. In general, the unpleasantness of electro-convulsion therapy was eliminated.

Quite obviously, all of these uses for curare deserve critical appraisal and confirmation from many sources, before they can be accepted unreservedly. However, the many recent papers that have appeared add up to the impelling fact that in curare we have a most valuable drug which, in skilled hands, can reduce the hazards of a host of operative procedures.

R.W. C.

EARLY POSTOPERATIVE AMBULATION AND HERNIA

ALTHOUGH European surgeons have for many years insisted that early postoperative ambulation is desirable, the practice has only recently come into "vogue" in this country. Much of the interest was stimulated through the efforts of Leithauser and Bergo in Detroit, who in 1941, published their results on the treatment of 436 patients.

During the past five years there have been several papers which have demonstrated more or less conclusively that early postoperative ambulation not only does not harm the patient, but actually guards him against the possibility of thrombo-embolism.

Blodgett and Beattie recently reported the results of their studies on the effect of early postoperative rising on the recurrence rate of hernia. Their control group consisted of 177 patients on whom 202 herniorrhaphies were performed, and who got out of bed on the seventh to fifteenth postoperative day. The experimental group consisted of 159 patients (174 herniorrhaphies), all except 12 of whom got up on the first postoperative day. The 12 got up on the second day.

In cases of indirect inguinal herniae, the recurrence rate among the early risers was 4.3 per cent; among the late risers (controls), 3.8 per cent. The recurrence rate in direct inguinal herniae was 11.1 per cent among the early risers, 12.2 per cent among the late risers. Total recurrence rates for all types of inguinal herniae were 6.0 per cent for early and 6.1 per cent for late risers. R.W.C.

This Month in Medicine

MATERNAL AND FETAL MORTALITY

MATERNAL and fetal mortality rates have been declining steadily in recent years. This trend is pointed out by Hellijas and his associates who have made a study at the Hartford Hospital over the fifteen-year period from 1931 to 1945.

Improvements in results are manifest in several of the categories investigated. Thus, during the period 1931-36, 3.0 women died for every 1000 pregnancies; in 1945 none died. Maternal mortality following delivery decreased from 0.27 per cent to 0.0 per cent during the period. Fetal loss has varied; however, the decline from 4.1 per cent to 2.6 per cent, over the fifteen-year period, appears significant.

The authors attribute these favorable mortality trends to the increased employment of agents for amnesia, analgesia, and anesthesia, and to the greater incidences of cesarean sections and forceps deliveries. During the fifteen years, forceps deliveries increased from 21.6 per cent to 61.0 per cent.

SUGGESTED READING

Hellijas, C. S.: Analgesia and anesthesia in obstetrics Anesthesiology, 8:113, March, 1947.

PENICILLIN AND DIPHTHERIA

SEVERAL articles have appeared during the past few weeks, in which the value of penicillin in treating diphtheria is discussed. Most writers agree that the drug has little if any value in preventing the toxic complications of the disease. There are exceptions, however: De and his associates used penicillin alone in the treatment of 27 patients with early or moderately severe diphtheria. Ten thousand units were inoculated intramuscularly every three hours for four to seventeen days. All patients recovered without complications.

While the consensus is that penicillin does not reduce the necessity of using antitoxin, writers are more or less unanimous in the belief that the drug reduces the length of convalescence and the carrier state. For this purpose, Weinstein recommends the administration of 120,000-240,000 units of penicillin per day for twelve days, during the acute stage of the disease. To treat the chronic carrier state, at least 240,000 units should be given each day for twelve days.

Karelitz and his associates treated diphtheria victims with both antitoxin and penicillin. Those who received both were rendered bacteria-negative more readily than those who received only the antitoxin. These investigators, as well as Kocher and Siemsen, believe that penicillin administered in nose drops or spray might be an effective method of treating carriers.

SUGGESTED READING

De, M. N., et al.: Penicillin in the treatment of diphtheria. Brit. Med. J., 1:376, March 22, 1947.

Weinstein, L.: The treatment of acute diphtheria and the chronic carrier state with penicillin. Am. J. Med. Sc. 213:308, March, 1947.

Karelitz, A., et al.: Penicillin in treatment of diphtheria and diphtheria carriers. J. Pediatrics, 30:18, January, 1947.

Kocher, R. A., and Siemsen, W. J.: Diphtheria carriers treated with penicillin. Ann. Int. Med., 24:883, May, 1946.

Peterson, R. L.: Status of penicillin in the treatment of diphtheria. Arch. Otolaryngology, 45:298, March, 1947.

DIAGNOSIS OF PROSTATIC CANCER

PROSTATIC cancer is the second most common cancer in the male. It kills 8,000 men every year. Many of these deaths could be prevented if earlier diagnosis was possible; for it is evident that, by present methods, less than 20 per cent of cases of diagnosed cancer of the prostate can be treated by radical prostatectomy. The remaining 80 per cent or more of cases are too far advanced by the time they are recognized to allow for surgical treatment and cure.

Over fifteen years ago, Mulholland of the Mayo Clinic suggested that the prostatic secretions might contain cancer cells. For some reason, the implications of his suggestion were not generally appreciated.

Quite recently, however, Herbut and Lubin of Philadelphia, made a cytological study of prostatic secretions obtained from 100 patients by massage. Seventeen of these 100 patients were diagnosed as having prostatic carcinoma, on the basis of the smears; the diagnosis was confirmed histologically in 10 and clinically in another 6 of the group.

The question arises, of course, as to the effect of massage on a cancerous prostate. The authors, while admitting the possibility of danger, point out that we do not hesitate to secure secretions from a benign hyperplasia of the prostate, in spite of the fact that 14 per cent to 46 per cent of these reveal occult carcinoma or carcinoma-like lesions. They feel that the early diagnosis more than justifies any hazard that may be associated with the massage.

SUGGESTED READING

Herbut, P. A., and Lubin, E. N.: Cancer cells in prostatic secretions. J. Urol. 57:542, March, 1947.

CIRCULATION TIME

Blood velocity is intimately related to heart disease. But there is no ideal method of determining the circulation time. Quite recently, however, thiamine has been found to possess properties that might make it useful as a reagent in determining the speed of blood flow from arm to tongue.

Ruskin and Decherd injected rapidly intravenously, in the arm, a 1 cc. solution containing 300 mg. of thiamine hydrochloride. A few seconds later the subject tasted and smelled the drug. The taste varied from that of brewer's yeast to that of stale fish.

Normal adults have circulation times varying from 5-13 seconds; most of the values fall between 7 and 10 seconds. Values in children are 4-8 seconds. Thirty-one patients with mild failure had circulation times of 8-25 seconds; 23 in moderate failure, 10-50 seconds; 17 in severe failure, 13-55 seconds.

The procedure needs refinements, which are now in progress. Further, the toxicity of thiamine for some persons is a factor that must be considered; several deaths have been reported. With proper precautions, however, this procedure might be found most serviceable in the diagnosis of heart disease.

SUGGESTED READING

Ruskin, A., and Decherd, G. M. Jr.: Thiamine circulation time. Am. J. Med. Sc. 213:337, March 1947.

DIAGNOSIS OF CANCER

Ayre of Montreal is making real headway in his drive on cancer. Latest development in his laboratory is a selective cytology smear which detects precancerous conditions of the cervix. Carcinoma of the cervix is most likely to occur at the squamocolumnar junction. Consequently, Ayre has suggested that cells be collected from that focus, before they have been exfoliated. To do this, he gently scrapes the tissues of the squamocolumnar junction with a small wooden spatula devised for this purpose.

This "surface biopsy" has distinct advantages over the well-known vaginal smear technique. Vaginal secretions contain all manner of cellular desquamata which frequently obscure the specifically malignant cells, and make the microscopic search time-consuming. Furthermore, surgical biopsy methods require that the malignant lesion be visible. Precancerous conditions, however, often are invisible. Hence, by the older method a precancerous state ordinarily would go unrecognized until frank malignant lesions appeared. That is too late.

"Surface biopsy" of selected tissues may be used in the diagnosis of any accessible surface cancer. Precancerous conditions of the tongue, lip, throat, skin and vulva may be studied in this manner. Ayre believes that with this technic, death from cancer of the cervix will be preventable.

SUGGESTED READING

Ayre, J. E.: Selective cytology smear for diagnosis of cancer. Am. J. Obstet. and Gynec., 53:609, April, 1947.

R. W. C.

Consultation Service

This special consultation information service is offered as a regular monthly feature of *Postgraduate Medicine*. Readers are invited to call on this Service for answers to difficult medical problems from members of our Editorial Board best qualified to help. Each question will be answered by mail and those of general interest will be published each month. Address all communications to Consultation Service, *Postgraduate Medicine*, 512 Essex Building, Minneapolis 2, Minnesota.

SKIN GRAFTS FOR SCALP

QUESTION: Is it possible or advisable to graft scalp for plastic procedures? A man, about forty years old, who received roentgen therapy of the scalp a number of years ago for a scalp infection, has become entirely bald. The scalp is pitted with telangiectasis and is very unsightly. What treatment would be advisable?

M.D.—New York

ANSWER: It is recommended that serious consideration be given the complete removal of involved skin, and replacement with thick split skin grafts. This is essentially a radiation dermatitis and the problem is not to get hair on the scalp, but to avoid serious breakdown of the skin. The periosteum should be left on the bone, as free grafts will not grow satisfactorily on bare bone.

There is no known way of grafting hair on a bald head. Flaps may be shifted from one site to another for coverage of certain areas, but the total amount cannot be added to.

POLYURIA

QUESTION: Is is possible for a stricture of the urethra or other obstruction in the urinary tract to cause polyuria? *M. D.—Illinois*

ANSWER: Yes, usually because patients with urethral stricture drink more than the normal amount of water. Obstruction at the bladder neck may cause large residual urine, interference with normal function of the kidneys, and polyuria of low specific gravity urine. Also consider diabetes; for no pathological reason many stricture patients have mild diabetes.

FENESTRATION OPERATION

QUESTION: My father, seventy-six years of age, is in remarkably good health, with the exception of a gradually increasing deafness which, for several years, has been partially compensated by a hearing device. The past year a further increase in deafness has occurred, and he writes me that one of his friends had a marked improvement in hearing as a result of an operation in Chicago which was called a "Window Operation." Can you give me any information concerning this operation, and whether an old man could stand it?

M.D.—Wisconsin

ANSWER: A fenestration operation would be of no value to a patient seventy-six years of age who has become deaf only in the last several years, because this type of deafness undoubtedly is of a senile nerve type.

PREMEDICATION FOR TONSILLECTOMIES

QUESTION: What is the consensus among doctors as to whether or not patients should have premedication before anesthesia for tonsillectomy?

M.D.—New York

ANSWER: The reasons for using premedication prior to tonsillectomy are practically the same as for any other operation. Adequate premedication relieves apprehension and reduces the metabolic rate, allowing for a more rapid induction for anesthesia, and using less of the anesthetic agent. It also minimizes the secretion of saliva and mucous which may tend to cause laryngospasm and respiratory obstruction.

Barbiturates prior to tonsillectomy under local anesthesia antagonize the toxic effects of local anesthetic agents. Codeine and atropine or morphine and atropine in appropriate doses may be used with benefit in all tonsillectomies three years of age and older.

EFFECT OF X-RAY ON PREGNANCY

QUESTION: I recently referred to a surgeon a woman with cancer of the breast, who had a palpable lump in her axilla which proved to be a metastasis. She is thirty-eight years of age with two normal children. She is three months pregnant. The surgeon advised deep x-ray therapy to her chest and axilla, as well as to her pelvis, in order to destroy her ovarian function. This treatment has been given, and the x-ray man remarked that it might cause an abortion; he also stated that the embryo might be born with serious developmental defects if it went to term. Can deep therapy, under such circumstances, produce an abortion, and could it result in the birth of a monster?

M.D.—Missouri

ANSWER: In our experience sufficient irradiation to destroy the ovarian function would be followed by miscarriage of a woman who is three months pregnant. In the event this did not occur, there might be developmental defects if the pregnancy proceeded to term.

SUN GLASSES

QUESTION: Will you please discuss the harmful or beneficial effects on the eyes of the average sun glasses sold in stores throughout the country?

M. D.—Pennsylvania.

ANSWER: When cheap colored glasses were first marketed many years ago there was a good deal of prejudice against them because they were poorly made, the lenses were full of flaws, and many of them were found to possess a small refractive error, usually about .50 D of myopic, or myopic astigmatic correction. The dark glasses for sale in drug stores and ten-cent stores now are remarkably well made and free from flaws and defects of curvature. Although small errors not suited to a person's refractive error may cause some slight distortion of vision or discomfort, they cannot be said to be harmful. It cannot be said that they ever cause any ocular disease, and people may be advised to get them and wear them without the risk of causing any disease of the eyes.

The continuous use of tinted lenses may result in one's becoming so accustomed to the protection from light and glare which they afford that one may become dependent on them, which is not desirable. At any rate, it is better to get the dark tints, usually referred to as "smoked," and not get blue glasses. The greenish tint known as "calobar" is satisfactory and the various shades of amber are less objectionable.

NITROUS OXIDE ANESTHESIA

QUESTION: What is the effect of nitrous oxide anesthesia on blood pressure during the period of its administration? *M.D.—Indiana*

ANSWER: Nitrous oxide of itself has no effect on blood pressure when it is administered with adequate oxygen. When a rise in blood pressure occurs during nitrous oxide anesthesia it is due to a decreased oxygen supply or to an accumulation of carbon dioxide. Heavy preliminary medication with a barbiturate and morphine and scopolamine or ether added to the nitrous oxide-oxygen mixture may be necessary to produce adequate anesthesia without cyanosis. Pentothal sodium intravenously may also be used to supplement the nitrous oxide.

MEN OF MEDICINE

OF KINGS AND PHYSICIANS

"The time has come, the Walrus said,
To talk of many things:
Of Shoes, and Ships, and Ceiling Wax,
Of Cabbages, and Kings."

I'LL BEGIN with kings, or more precisely with one king, a little king, for I have known but one king, and he was little. It was when the King of Siam came to New York so that John Wheeler might remove the cataract from one of his eyes. Wheeler asked me to stand by on the morning of the operation, and I came along full of eagerness.

The King's temporary "palace" was in the Westchester residence of one of our American mining barons. One palatial room had been cleared of everything and draped with sheets. A simple table, an instrument stand and a spotlight was the total of the surgical paraphernalia present.

The King, a slight man, walked in, nodded in greeting and, taking off his undershirt, mounted the table. Wheeler, soft-spoken, kindly, dexterous and reassuring, began a slow stream of expletives, accounting for each of his moves; the local anesthesia, the fixing of the lids, the preliminary sutures, etc. But his talking ceased when the surgery began in earnest. Not that there was any mounting or dramatic tension; it would just have been unseemly and quite unnecessary to chatter on. Wheeler was busy with his task, and those about (there were two of us there), were quite spellbound by the precise, fine, and so very knowing movements of his hands. Then the lens was couched, and out it slipped, and precisely at that moment the slight, silent figure that had lain there so patiently and passively spoke up and said, simply but with a revealing tinge of eager joy, "I see light!"

Wheeler completed the operation, then placing the cataract lens in a small bottle containing some alcohol, he commissioned me to present it to the Queen. We had been introduced to the gracious lady earlier that morning, and I knew she was waiting in one of the nearby rooms to have word on "how it went." Yet it was with some trepidation that I accepted Wheeler's commission. For I didn't quite know what one says to a queen on presenting her with the "pickled eye lens" of her royal spouse. One's words on such an occasion are likely to do down in history! Well, if history is curious as to what *I* said, it's doomed to be disappointed, for I don't remember. But I well remember the Queen's words: taking up the little bottle and contemplating the small globule floating near the bottom, she spoke up in a soft, hesitating incredulity, and said, "Is that all?"

There was an easy informality about this royal pair and their entourage. They seemingly well appreciated that any insistence on protocol, or on prerogatives would not only not sit well, but would embarrass the performance of the necessary medical tasks. The Chamberlain to the royal house "briefed us" before presenting us. We could deal with the royal pair, he said, as we do with our own dignitaries, shake hands, call him Sir, and her Madam, and ask and say what was seeming. One thing only he prayed we might not do, and that was: turn our back on the King.

The King is dead and Wheeler is dead. The events here described seem as of another age. Yet thinking back on them I am impressed, as I was not at the time, with how very reasonable was the Chamberlain's request. "Do not, I pray you, turn your back on the King." I'm sure he meant it literally, for Chamberlains and such like, I'm told,

JOHN MARTIN WHEELER, M.D.

are literal persons. But even then, I think I understood him figuratively, and counted his a reasonable request. For it is a small thing to ask, and a good thing to observe: Not to turn one's back on the King; no, nor on any man.

WHEELER was a rare person; pleasant, modest, gracious, thorough and unhurried. He had an impish and sparkling sense of humor. It is told of him that when the King asked what fees should be paid him, Wheeler responded with the witty double entendre, "The King can do no wrong." I'll not vouch for the tale, but only say as the Italians do: *Si no è vero è ben trovato.*

John Martin Wheeler was a Vermonter through and through. There he was born, there he was educated, there he was married, and there he died. He came to his specialty by the anatomist route. In 1908, he turned to ophthalmology, beginning his ascent to pre-eminence at the New York Eye and Ear Infirmary. In 1928 he was appointed Professor of Ophthalmology at Columbia University, and when the Eye Institute was built at the Columbia Presbyterian Medical Center, he became its first director.

Wheeler designed the operating theatre in which he did so much of his superb work, and where those who came to study and to witness found an unobstructed view of what was going on. In this theatre there was a circular visitors' balcony *overhanging* the operating table, with glass windows, through which, with the aid of opera glasses, the observer could get a most satisfactory view.

Three years before he died, Wheeler diagnosed the presence of a malignant growth in one of his eyes. The eye removed, Wheeler, after a brief period of practice, and despite the loss of stereoscopic vision, resumed his surgical work with undiminished skill. He died of a heart attack in 1938.

G.

Book of the Month

EXPERIENCES WITH FOLIC ACID*

THE results of the clinical use of synthetic folic acid in human beings, first reported by Spies and his associates in September 1945, constituted a medical event of great significance. For the first time, a single synthetic chemical compound of known molecular structure was found to be effective in treating persons with pernicious anemia, nutritional macrocytic anemia, and sprue.

In "Experiences with Folic Acid," Dr. Tom D. Spies, associate professor of medicine, University of Cincinnati School of Medicine, and director of the Nutrition Clinic, Hillman Hospital, Birmingham, Alabama, reports on the clinical studies made by him and his associates at the centers in Cincinnati and Birmingham and in collaboration with the University of Havana Medical School and the School of Tropical Medicine at San Juan, Puerto Rico. As a result of this work, the author states that it has been shown conclusively that folic acid given either by mouth or parenterally induced a "striking hemopoietic response similar to that which follows the administration of a potent liver extract."

The program followed by the investigators involved the: (1) study of the relationship of bacterial flora of the alimentary tract to folic acid therapy, (2) the relationship of intestinal parasitism to folic acid therapy, and (3) the effect of folic acid on the alimentary tract as shown by roentgen changes before, during, and after treatment with folic acid.

Observations were made on 218 persons who have received folic acid. Their ages ranged from 19 to 83 years. Nine were Negroes and the rest white. Every person with addisonian pernicious anemia, sprue, nutritional macrocytic anemia, macrocytic anemia of pregnancy, and nutritional leukopenia has responded satisfactorily.

*Experiences with Folic Acid. By Tom D. Spies, M.D., 110 pages. 34 illustrations; 4 color plates. Year Book Publishers, Chicago, 1947. Price $3.75.

Folic acid, the newest member of the vitamin family, is the name originally given a substance obtained in a nearly pure form from spinach by Mitchell, Snell and Williams. This substance supports a growth for two organisms frequently used in microbiologic investigations: Lactobacillus casei and Streptococcus lactis R (now termed Streptococcus faecalis). Its potency for S. lactis R was used as a guide in purification procedures, and "folic acid" is defined specifically as a growth factor for that organism.

In this report on the efficacy of folic acid therapy, Dr. Spies has attempted to survey the whole field so that the discussion will prove serviceable not only to the physician, but also to the biochemist, the biologist, and the student of nutrition.

The author states that observations made up to the present time suggest that in most cases folic acid is as effective in producing blood regeneration and maintaining the blood at satisfactory levels in persons with addisonian pernicious anemia, nutritional macrocytic anemia, and the macrocytic anemia of sprue as is liver extract, but that it does not protect against the central and peripheral nervous system changes which frequently develop in persons with addisonian pernicious anemia nor will it reverse these neural changes once they have developed. These observations, says Dr. Spies, "suggest that until more is known of the mode of action of folic acid in hemopoiesis and until a factor essential to the preservation of the central and peripheral nervous systems is found, liver extract is the safest and most effective therapeutic agent for the routine treatment of pernicious anemia."

As yet there has been no satisfactory explanation offered for the fact that, to produce a satisfactory hemopoietic response, a relatively large amount of folic acid is required as compared with liver extract in which the amount of active substance is much smaller.

An advantage of the use of folic acid lies in the

fact that it may be administered either orally or parenterally, although the latter method is preferred as it permits strict control of the therapy by the physician. Spies hypothesizes that the active principle in liver extract is not folic acid but is a more powerful substance which, when obtained in pure form, will be more efficacious per unit of weight than any now available. He poses the theory that folic acid conjugates are stored in our bodies and that liver extract contains substances capable of liberating them so that they can act on the cells of the bone marrow.

Although folic acid has been effective in the treatment of addisonian pernicious anemia, nutritional macrocytic anemia, and the macrocytic anemia of sprue, the author feels that it is doubtful that either folic acid or the other chemical substances that will be found to act similarly will prove to be of importance in the treatment of leukemia, aplastic anemia, hemolytic anemia, and drug idiosyncrasies associated with a leukopenic state.

Though these experimental studies have not covered a sufficiently long period to prove conclusively the lasting benefits to be derived from folic acid therapy, and though no incontroversial explanation is offered of the mechanism of folic acid therapy, "Experiences with Folic Acid" is nevertheless a valuable and timely contribution to the fields of nutrition and hematology.

BOOKS RECEIVED THIS MONTH

A TEXTBOOK OF PATHOLOGY: by E. T. Bell, M.D., Professor of Pathology, University of Minnesota, Minneapolis, Minn.; contributors: B. J. Clawson, M.D., Professor of Pathology, and J. S. McCartney, M.D., Associate Professor of Pathology, both of University of Minnesota.

New material, both in text and illustrations, has been introduced and much of the work has been thoroughly revised. Among the topics discussed more intensively than hitherto are vitamin deficiencies and the tropical diseases. The author emphasizes the fact that clinical medicine is a direct continuation of pathological studies and not an abrupt entrance into a new field. The work offers a complete review of the field of general pathology. References to the literature have been carefully selected, and an explanatory note after each reference enables the reader to select those phases of the subject about which he desires more information.

Sixth edition, enlarged and thoroughly revised, 910 pages, with 500 engravings and 4 color plates. Lea & Febiger, Philadelphia, 1947. Price $10.00.

DISEASES OF THE CHEST WITH EMPHASIS ON X-RAY DIAGNOSIS: By Eli H. Rubin, M.D., F.A.C.P., F.C.C.P., Attending Physician, Division of Pulmonary Diseases, Montefiore Hospital and Country Sanatorium, New York; Visiting Physician in Tuberculosis and Physician-in-charge, Chest Clinic, Morrisania City Hospital, New York. 685 pages, with 355 illustrations (24 plates in color). Philadelphia and London: W. B. Saunders Company, 1947. Price $12.00.

A TEXTBOOK OF MEDICINE: Edited by Russell L. Cecil, A.B., M.D., Sc.D., Professor of Clinical Medicine, Cornell University Medical College; Consulting Physician, New York and Veterans' Hospitals; Visiting Physician, Bellevue Hospital, New York City. With assistance of Walsh McDermott, M.D., Associate Professor of Medicine, Cornell University Medical College. Associate Editor for Diseases of the Nervous System: Harold G. Wolff, M.D., Associate Professor of Neurology, Cornell University Medical College. Seventh Edition. 1730 pages, with 244 illustrations. Philadelphia and London: W. B. Saunders Company, 1947. Price $10.00.

SURGICAL PATHOLOGY: By William Boyd, M.D., Dipl. Pysch., M.R.C.P. Ed., F.R.C.P. Lond., LL.D., Sask., M.D., Oslo, F.R.S.C., Professor of Pathology, The University of Toronto, Canada. Sixth Edition. 858 pages, with 530 illustrations, including 22 color figures. Philadelphia and London: W. B. Saunders Company, 1947. Price $10.00.

DISEASES OF METABOLISM: Detailed Methods of Diagnosis and Treatment—A Text for the Practitioner: Edited by Garfield G. Duncan, M.D., Director of Medical Division, Pennsylvania Hospital; Clinical Professor of Medicine, Jefferson Medical College, Philadelphia. Second Edition. 1045 pages, with 167 figures. Philadelphia and London: W. B. Saunders Company, 1947. Price $12.00.

TUBERCULOSIS, AS IT COMES AND GOES: By Edward W. Hayes, M.D., F.A.C.P., Associate Professor of Tuberculosis, College of Medical Evangelists, Los Angeles. With chapters by Laurence de Rycke, Ph.D. Second edition. 220 pages. Charles C Thomas, Springfield, Ill., 1947. Price $3.75.

PRINCIPLES AND PRACTICE OF MEDICINE: Originally written by William Osler, M.D., F.R.C.P. Designed for the use of practitioners and students of medicine by Henry A. Christian, A.M., M.D., LL.D., (Hon.) Sc.D., Hon. F.R.C.P. (Can.), F.A.C.P., Sixteenth Edition. 1539 pages. D. Appleton-Century Company, New York and London, 1947. Price $10.00.

GYNECOLOGY with a section on FEMALE UROLOGY: By Lawrence R. Wharton, Ph.B., M.D., Assistant Professor of Gynecology, The Johns Hopkins Medical School; Assistant Attending Gynecologist, The Johns Hopkins Hospital; Consultant in Gynecology, The Union Memorial Hospital, Hospital for the Women of Maryland, Sinai Hospital and Church Home and Infirmary. Second Edition. 1027 pages, with 479 illustrations. Philadelphia and London: W. B. Saunders Company, 1947. Price $10.00.

What Other Editors Think

Editorial Evaluations of Current Contributions To Medical Progress

RED CELL TRANSFUSIONS

The large scale preparation of plasma during the recent war made available considerable quantities of red cell residues. The value of red cell transfusions in the treatment of anemia was recognized first in England and later in this country. Through the Blood Donor Service of the American Red Cross, red cell suspensions were distributed without cost to civilian hospitals in several urban centers. Through these experiences, red cell transfusions for the treatment of anemia have become a well established therapeutic procedure.

Red cells may be given in their concentrated form or isotonic saline solution equivalent to the amount of plasma withdrawn may be added. The hematocrit of a concentrated red cell suspension averages 85 to 95 per cent which means that about 10 per cent of the plasma remains behind. This is sufficient to allow such a suspension to run freely through an 18 or 19 gauge needle. The flow is facilitated by raising the height of the suspension and by occasional agitation. Because of the small amount of plasma present, concentrated type O cells can be given safely to recipients of any blood group. As a precaution, the recipient's serum should always be matched against the donor's cells before use. Red cells remaining from blood drawn into citrate solution should be used within five days. Addition of a 10 per cent solution of corn syrup will preserve red cell suspensions for fourteen to twenty-one days.

For the treatment of anemia, red cell transfusions are as effective as an equivalent amount of whole blood. A similar rise in the erythrocyte count and hemoglobin value occurs and the survival period of the cells is the same with both types of transfusion.

Probably the chief advantage of the transfusion of red cell suspensions over whole blood is the factor of economy. Another advantage of red cell suspensions is the fact that type O cells can be given to recipients of any blood type. Type O whole blood with a high agglutinin titer in the serum is a potential source of danger when used universally. The reduced volume of concentrated red cell suspensions as compared to the original volume of the whole blood from which it is obtained also has advantages. The cells from one to two liters of blood can be given over a period of several hours thus causing rapid and marked increases in the erythrocyte count. In some cases it is desirable that sufficient blood be given to raise the erythrocytes and hemoglobin to normal over a short period of time. The danger of overloading the circulation is an important consideration in patients with cardiac disease or with anemia alone. Deaths due to cardiac failure may result from the rapid administration of blood to a severely anemic patient. This danger is lessened with the use of concentrated cell suspensions.

In the average hospital, over half the blood transfusions are given primarily for the treatment of anemia. These patients would benefit equally from red cell suspension transfusion. In patients with iron deficiency anemia the hemoglobin can be raised rapidly with cell transfusions; as the transfused cells die off, the iron released becomes available for the formation of new erythrocytes. Spontaneous recovery of the anemia following hemorrhage or the recovery of pernicious anemia with liver therapy requires about six weeks. Convalescence is greatly hastened in such cases by the transfusion of the red cells from one or two liters of blood. Red cell transfusions are ideal for patients with aplastic anemia and other blood dyscrasias where the rate of blood formation is less than that of blood destruction.

It is needless to say that red cell transfusions, just as whole blood, should be given only when clear cut indications are present.

Howard L. Alt, Surgery, Gynecology and Obstetrics, Vol. 84, p. 997. Loyal Davis, M.D., Editor-in-Chief.

CONTROL OF AIR-BORNE INFECTIONS

When any new procedures are introduced in public health, we must expect a swing of the pendulum between extremes of enthusiastic acceptance and of cautious negation. Recent suggestions with regard to the disinfection of air by ultra-violet irradiation or by the use of aerosols and the reduction of atmospheric pollution by control of dust form no exception to the rule.

Since the subject was discussed in these columns on an earlier occasion, the pendulum has been swinging toward the side of a not unwholesome scepticism, as presented in two reports published in an earlier number of this journal. With the Special Review Article, which opens the present issue, the time seems ripe for a review of recent trends of thinking in Aero-Eridemiology.

The first of the articles in question was the Report of the Subcommittee for the Evaluation of the Control of Air-borne Infections of our Association Committee on Research and Standards, under the chairmanship of J. E. Perkins. This report deals particularly with the control of the spread of disease by droplet nuclei and air-borne dust, considering "droplets," as distinct from "droplet nuclei, to be a form of direct contact infection.

The article points out that the value of control of secondary infections by irradiation in operating rooms has been impressively demonstrated; that striking results have been reported as to control of communicable diseases in contagious pavilions and pediatric wards; that irradiation of the upper air of schoolrooms in Swarthmore and Germantown, Pa., apparently controlled two epidemics of measles and showed beneficial results in an epidemic of chicken pox. Mumps, which prevailed at a time when relatively high humidity existed (under which conditions ultra-violet light is least efficient) showed less clear results. At Camp Sampson, a group of naval personnel protected by irradiation showed a 25 per cent lower incidence of "respiratory admissions" than did a control group. There seems no reason to doubt that the use of glycol vapors, in aerosol form, might produce similar results; but no similar controlled epidemiological investigations have been made with these types of disinfectants.

The major conclusions of this report may be summarized as follows:

"The oiling of floors, blankets, and bedding has now developed to the point of practical application in the suppression of dust. Such measures constitute good housekeeping. They reduce bacterial contamination of the air, but there is as yet insufficient evidence that they prevent disease.

"The available evidence strongly indicates that methods of air disinfection (ventilation, ultra-violet irradiation, and glycol vapors) are useful adjuvants to aseptic techniques in the reduction or elimination of air-borne infections in operating rooms and in contagious disease and pediatric wards.

"The general use of ultra-violet irradiation or disinfectant vapors in schools, barracks, and in specialized industrial environments is not justified at the present time. There is great need for further carefully controlled field studies to define the mechanisms of the spread of infectious disease among these types of populations.

"There is no justification for the indiscriminate use of ultra-violet light or other methods for disinfecting air in homes, offices, or places of public congregation."

American Journal of Public Health, Vol. 37, p. 450. Reginald M. Atwater, Managing Editor.

MOLD FILTRATE

Undulant fever has for many years remained a rock upon which the entire fleet of new therapeuticals crashed. It is widespread in incidence, because there are still many infected cattle; and the difficulty of diagnosis and variable character of the disease make evalution of any new method of treatment difficult. According to Hyman, there is no great promise from anti-infective therapy in brucellosis.

Penicillin is ineffective in the usual concentrations. Beal of the University of Chicago, notes that Brucella abortus is inhibited by high concentrations of penicillin, but its resistance is so great that the drug in concentrations of 2-5 Oxford units per ml.

has been used for selective isolation of the organism from material containing more sensitive bacteria. The ordinarily susceptible strains are inhibited while Brucella grows abundantly.

Beal has attempted to discover a mold product more active than those now in use. A number of molds were tested which were obtained from yards in which cattle with undulant fever were kept. Thirteen filtrates were tested against Brucella abortus, all of which possessed some *in vitro* activity. A mold tentatively identified as Aspergillus terreus, the filtrate of which was partially purified, was found to be active against Brucella abortus *in vitro* at a concentration of 1-64,000. If this product should continue to prove active and non-toxic, it may offer hope for the relief of this very considerable scourge.

Southern Medical Journal, Vol. 40, p. 448.

CARDIAC CATHETERIZATION

The technique of intracardiac catheterization, based mainly on the pioneer work at the Bellevue Hospital, New York, and on subsequent research in Atlanta and at the British Postgraduate Medical School, continues to develop, and its use has now spread to many hospitals in the United States as well as to Sweden, France, and Switzerland.

Cournand and his colleagues in New York have used the cardiac catheter for optically recording intracardiac pressure pulses on the right side of the heart. To the end of a catheter of sufficiently wide bore they attach a small membrane manometer recording optically on moving photographic paper. By means of a double-lumen catheter, simultaneous records may be made from two parts of the cardiovascular system, such as the right auricle and ventricle, or the right auricle and peripheral veins. The maximum pressure reached in the right ventricle in normal people has been found to average 25 mm. Hg. In patients with emphysema without heart-failure the pulmonary systolic pressures ranged from normal to 57.5 mm. Hg., and there was apparently no correlation between pulmonary hypertension and the severity of the emphysema.

When heart-failure develops, a whole series of changes take place in the intra-auricular and intraventricular pressure curves. Ordinary arterial hypertension without failure, however, does not affect the pressures on the right side of the heart, the pressure in the pulmonary artery remaining normal. By studying the pulse pressure and the amplitude of the auricular and ventricular pressure waves conclusions can be drawn regarding the changes in output per beat during the respiratory cycle. Inspiration assists the filling of the chambers of the right heart, so stroke output is increased; while during expiration the output of the right auricle and ventricle falls. In the early part of inspiration the increased output of the right ventricle is accommodated in the lungs, but a little later the left ventricle gets the increased flow and the systemic arterial pressure rises.

Proceeding along simpler lines of measurement of filling pressure and output per minute, Howarth, McMichael, and Sharpey-Schafer at Hammersmith, found that in "low output heart-failure" venesection lowers the venous pressure and raises the output of the heart. By comparison in similar groups of cases, they showed that lowering venous pressure by mechanical means and by digitalis have identical effects on cardiac output. Venesection, however, lowers the blood-pressure, while digitalis may leave it unchanged or even raised; so the heart is actually doing more work after digitalis than after venesection.

Warren and others have drawn attention to the possibility of errors in the estimation of cardiac output arising from incomplete mixing of blood in the right auricle. Duplicate samples taken in this situation were found to differ from one another in oxygen content by more than 0.4 vols. per cent in a fifth of the cases studied. Similar studies by Cournand showed, however, that the differences between duplicate samples from the right heart were very seldom more than 0.4 vols. per cent. McMichael thinks that anomalous samples are obtained only about once in 20 cases. Any error arising from incomplete mixing is readily detectable by comparing right ventricular with right auricular samples and by duplicate sampling at critical points in all experimental observations.

The Lancet, Vol. 252, p. 334.

New Drugs

The information in this department has been supplied to *Postgraduate Medicine* by the manufacturers of the products described.

NIDOXITAL

PURPOSE: For control of nausea and vomiting during pregnancy.

COMPOSITION: The following drugs are combined additively into a sugar-coated tablet.

Benzocaine	100 mg.
Pyrodoxine hydrochloride	50 mg.
Nicotinamide	25 mg.
dl Methionine	100 mg.
Pentobarbital sodium	15 mg.

ACTION: The immediate effect of Nidoxital components is reported to be as follows: Benzocaine depresses the nerves locally and reduces the response of the esophagus, stomach and intestine to different stimuli. Pentobarbital sodium reduces the sensitivity of the so-called vomiting center in the pons. Nicotinamide decreases peristalsis.

DOSAGE: Recommended dosage is one tablet taken orally 30 to 45 minutes before meals. In more severe cases, one tablet every 45 minutes for three doses, the series to be repeated within four hours or as indicated, up to 10 tablets per day.

CAUTIONS: Contraindications to the use of Nidoxital are given as hypotension, hypertension, nephritis, chronic hepatic diseases, adrenal disorders, macrocytic anemia of pregnancy and psychoneurosis of pregnancy.

HOW SUPPLIED: In boxes containing four cellophane strips of six tablets each. Available on prescription only.

PRODUCER: Ortho Pharmaceutical Corporation, Raritan, N. J.

DIGISIDIN

PURPOSE: Heart tonic and diuretic.

COMPOSITION: Pure crystalline digitoxin, the principal glycoside of Digitalis purpurea.

DESCRIPTION: White, almost odorless, bitter microcrystalline powder which is slightly hygroscopic. Stable, does not change in potency on prolonged storage.

ACTION: The effect of Digisidin on the heart is identical with that of digitalis. Absorption of Digisidin from the gastro-intestinal tract is practically complete and very rapid. Elimination occurs slowly, less than one-third of its effect wearing off in four days.

INDICATIONS FOR USE: Digisidin is used for the same indications as digitalis, that is, acute and chronic heart failure including auricular fibrillation.

DOSAGE: The average digitalizing dose is 1.2 mg. provided no digitalis has been received by the patient for two weeks. This may be given in one single dose or in fractions of 0.3 to 0.4 mg. at intervals of four to six hours. The maintenance dose is from 0.1 to 0.2 mg. daily. If a patient has been receiving digitalis, the dosage of Digisidin to be substituted comprises 0.1 mg. of Digisidin for each 0.1 gm. of digitalis leaf. It is not necessary to wait for complete excretion of digitalis before continuing with a corresponding maintenance dose of Digisidin.

CAUTIONS: Systemic side effects of Digisidin are the same as those of digitalis.

HOW SUPPLIED: Tablets of 0.1 mg. (pink), bottles of 50, 100, and 500. Tablets of 0.2 mg. (white, scored), bottles of 50, 100, and 500.

PRODUCER: Winthrop Chemical Company, Inc., New York 13, N. Y.

SOLU-B WITH ASCORBIC ACID, STERILE

PURPOSE: Vitamin B and C therapy.

COMPOSITION: Each vial of Solu-B contains, as a sterile dry powder:

Thiamine hydrochloride	10 mg.
Riboflavin	10 mg.
Pyridoxine hydrochloride	5 mg.
Calcium pantothenate	50 mg.
Nicotinamide	250 mg.

and is accompanied by one 5 cc. ampul:

Ascorbic acid, sterile solution	500 mg.

INDICATIONS FOR USE: For prevention and treatment of vitamin B and C deficiencies, particularly in patients who cannot take adequate amounts orally.

DOSAGE: The contents of one vial of Solu-B dissolved in 5 cc. of sterile solution ascorbic acid, 500 mg., may be injected intravenously or intramuscularly or added to infusion solutions.

HOW SUPPLIED: Five 10 cc. size vials and five 5 cc. ampuls ascorbic acid, 500 mg., sterile solution $4.40. Twenty-five 10 cc. size vials and twenty-five 5 cc. ampuls ascorbic acid, 500 mg., sterile solution $20.90.

PRODUCER: The Upjohn Company, Kalamazoo 99, Mich.

INTRACAINE IN OIL, SQUIBB

PURPOSE: To provide a local anesthetic for the relief of pain over a prolonged period of time.

COMPOSITION: Sterile solution of beta-diethylamino ethyl p-ethoxy benzoate (Intracaine Base) in corn oil.

DESCRIPTION: A clear, clean yellow liquid. Specific gravity about 0.93 at 25°C.

INDICATIONS FOR USE: For nerve block in the treatment of intractable pain or muscle spasm and for bladder spasm.

DOSAGE AND ADMINISTRATION: Intractable pain: 2 or 5 per cent strength. Usually an injection of a 1 per cent aqueous solution of Intracaine hydrochloride is made first for immediate relief. The syringe is then removed, leaving the needle *in situ* and, relief having been obtained, an injection of 2 to 5 cc. of 2 or 5 per cent Intracaine in Oil is administered through a second syringe, without disturbing the needle. Relief from pain may continue for even four to six weeks. Bladder spasm: 20 to 30 cc. of 5 per cent strength instilled directly into the bladder, repeated as symptoms indicate.

CAUTIONS: A considerable number of fatalities have occurred from the administration of local anesthetics into the urethra, especially in the presence of trauma. When so administered the operator should be prepared to give an intravenous barbiturate as an antidote in case toxic symptoms should arise. Acute toxic symptoms, such as might result from accidental intravenous injection, should be promptly treated in the same manner.

HOW SUPPLIED: Sterile solution of Intracaine Base in corn oil in two strengths: 20 mg. per cc. and 50 mg. per cc. in 30 cc. rubber diaphragm-capped bottles.

PRICE: 20 mg. per cc. 30 cc. bottle $3.33
50 mg. per cc. 30 cc. bottle $3.92

PRODUCER: E. R. Squibb & Sons, New York, N. Y.

AQUEOUS SUSPENSION OF ESTROGENIC SUBSTANCE—BREON

PURPOSE: For use where a steady prolonged estrogenic effect is desired.

DESCRIPTION: A new preparation for intramuscular injection. In processing, the solid estrogenic material is divided into exceedingly small particles by reprecipitation and screening through a micro-mesh.

DOSAGE: Dosage is individualized. In the menopause, for instance, an injection once or twice weekly until the patient is estrogen-stabilized may control the symptoms without further administration for from one to three months.

HOW SUPPLIED: In 1 cc. ampuls of 20,000 International Units, each, in boxes of 6, 12, 25 and 100.

PRODUCERS: George A. Breon & Company, Kansas City, Mo.

FOLBESYN VITAMINS LEDERLE

PURPOSE: For parenteral treatment of vitamin deficiencies.

COMPOSITION: Each package of Folbesyn Vitamins Lederle consists of a vial of dried vitamins containing thiamine hydrochloride (B_1), 5.0 mg.; sodium pantothenate, 10.0 mg.; and ascorbic acid (C), 75.0 mg., which is to be dissolved in Folbesyn vitamin diluent containing 2 cc. of Folvite folic acid solution, 3 mg. in 2 cc.

INDICATIONS FOR USE: For parenteral administration of vitamins in preoperative and postoperative care of weakened patients and in treatment of vitamin deficiencies where immediate absorption of thiamine, riboflavin, niacinamide, ascorbic acid and folic acid is essential.

DOSAGE: Dosage is 2 cc. daily; or more, in the judgment of the physician, if the depletion is severe.

HOW SUPPLIED: In packages containing a 2 cc. ampul and a 3 cc. vial, enough for one dose, or in sets of 25.

PRODUCER: Lederle Laboratories Division, American Cyanamid Co., Pearl River, N. Y.

PROTOGEST

PURPOSE: To supply protein nitrogen.

COMPOSITION: Protein hydrolystate with added salt and vegetable flavoring; each 100 gm. is equivalent to 77 gm. of unhydrolyzed protein.

DESCRIPTION: A flavored preparation for oral administration, containing all the known essential amino acids and a number of polypeptides of low molecular weight.

INDICATIONS FOR USE: Protogest may be given alone or as a dietary supplement, can be mixed with hot or cold water, seasoned if desired with salt, celery, onion, or other condiments and may be mixed with foods or with soups.

DOSAGE: Quantity to be administered is determined according to patient's dietary history, physical condition, and current nitrogen balance.

HOW SUPPLIED: In bottles of 1 pound.

PRICE: $5.25.

PRODUCER: Burroughs Wellcome & Company, New York, N. Y.

SALINIDOL

PURPOSE: Treatment of fungus disease of the scalp.

COMPOSITION: Saliyllanilid . 5 per cent.

DESCRIPTION: In a non-greasy water soluble base.

DOSAGE: Applied daily, rubbed into the scalp.

HOW SUPPLIED: 4 oz. 1 lb. 5 lb.

PRICE: $1.25. $3.50. $15.00

PRODUCER: Doak Company, Inc., Cleveland, Ohio.

Correspondence

Communications from the readers of *Postgraduate Medicine* are always welcome and should be addressed to the Editors, *Postgraduate Medicine*, 512 Essex Building, Minneapolis 2, Minn.

To The Editor:

Thirty years ago, I was one of the first to produce and present medical and surgical motion pictures for the teaching of medical students, as well as the medical profession at large. The object of such films was to facilitate the study of the various subjects requiring visualization both for the students and physicians.

At the beginning, this idea was scoffed at and was even ridiculed and censured. Now, one hardly attends any medical convention of any standing, or postgraduate courses on medical subjects, without having motion pictures presented as part of the curriculum or program. The value of medical motion pictures is now an accepted fact.

A greater era of medical education, in its broadest sense, is now on the horizon in the form of television.

Enough television sets will, in the near future, be owned by individuals and educational organizations to make it practical to disseminate knowledge pertaining to public health in general, and medicine and surgery in particular, through this medium.

Some difficulties of presenting medicine and surgery by television, no doubt, will be encountered, but these will be surmounted. The problem of presenting medical subjects for the medical profession by means of a public medium, such as radio and television, will be solved.

The public can be made to realize that "telecast" presentations are intended for the medical profession only. If they happen to tune in on such a program, all they will have to do is to turn the knob of the television set to another "video" program. When one visits a public library and opens a book with illustrations intended for the medical profession, he will close it, unless he is particularly interested.

If such a policy is not desirable, then, the alternative will be to assign a special wave length to television sets for the medical video audiences, similar to those assigned for aviation and other fields.

The presentation of medicine and surgery by television will have the following objectives:

1. To make it possible for everyone to utilize all medical and surgical films in existence, without being obliged to rent or purchase them for one's own library.

2. To establish a central library through which television programs could be furnished throughout the land.

The object of such a center should be:

1. To help in the teaching of medical students and those of the allied professions, such as dentistry, nursing, and pharmacy.

2. To maintain the medical and allied professions on a high level of efficiency by continuous study and review of their respective fields. To review the basic sciences such as anatomy, physiology, pathology, medicine, and surgery, and to keep up to date by presenting the new discoveries and new methods of diagnosis and treatment.

3. To enable rural physicians and those isolated from the medical centers to keep well informed in the various fields of medicine and surgery, and thus encourage the settlement of enough doctors in these localities where they are badly needed.

4. To furnish in cases of dire stress of medical and surgical emergencies on land, sea and air, the method of emergency treatment best suited under the circumstances.

5. To foster public health education by suitable educational forums for the betterment of the health of the communities and the nations.

For the efficient functioning of a television center, or clinic of medicine and surgery, it will be necessary to have an organization with an advisory board, consisting of leaders from the various fields of medicine, surgery and the allied professions, and men and women of prominence in the fields of public health education and television.

(Left) Television engineer focuses RCA image orthicon camera on operating table. (Right) Camera suspended above operating table at Johns Hopkins Hospital transmits procedure to nearby viewing rooms.

The programs could be arranged to suit the requirements of medical students, general practitioners, and specialists. They could include:

1. The presentation of films on chosen subjects.
2. A telecast round table discussion by men of prominence and authority in the same field. These roundtable discussions may be recorded for rebroadcasting.
3. On favorable occasions, special medical and surgical clinics may be televised.

There is enough available material in the form of motion pictures from various sources, dealing with anatomy, physiology, pathology, research, medicine, and surgery, to continue these programs indefinitely. Of course, new material is being constantly added.

During the past thirty years I have used over a million feet of motion picture film and now have over 500 reels dealing mainly with anatomy, surgical pathology, general, and plastic surgery. Many other individuals and institutions have great collections of valuable medical and surgical motion pictures that can be used for teaching purposes, in the form of television, as well as the regular motion picture programs.

These programs can be arranged and scheduled months in advance so that the various medical journals could publish such curricula, and announcements could be mailed to every physician, members of the allied professions, universities, hospitals and medical societies. Video programs intended for the general public should be announced in the television columns of the daily press.

These telecasts would find many a sponsor. Millions are spent annually by the various pharmaceutical houses in advertising their products. What better means can they have of reaching the medical profession than that of television?

Educational foundations, various universities, and municipal broadcasting stations can all cooperate in the perfecting of these programs.

All programs must comply with the recognized code of medical ethics. The widespread support thus gained from the various sources should enable us to present the best possible programs to the greatest number of people as a service in the interest of public health and medical education.

Jacob Sarnoff, M.D.
Brooklyn, New York

After Hours

MUSICAL MEDICOS

MAKING music symbolizes the physician's aspiration toward harmony in an unharmonious world. All over the country groups of doctors look to music as a soothing tonic. Some take the study seriously. Others toot or fiddle to take their minds off Tillie Thompkins' temperature for an hour or so. Thumping the chests of a couple of kettle drums or concentrating on a bumpy trombone passage is an excellent antidote for worry about the bumps in a patient's personality.

This crossing of the scalpel and the baton was begun by Aesculapius, who excelled not only in surgery but also in music. So well did the god of medicine learn his harmony, says Dr. Victor Robinson in the foreword to Dr. Willard Marmelzat's book, *Musical Sons of Aesculapius,* that he found himself directing the Muses in their musical activities.

Dr. Marmelzat's book, written while he was still a medical student at Tulane, was published by the Froben Press while he was serving in the Navy. For this interesting research Dr. Marmelzat received the William Osler medal and the Rudolph Matas award. He says:

"I had first realized that music and medicine are often blissfully wedded, when I entered medical school. Among my classmates were a number who did not allow the rigid medical schedule to repress completely the relaxation, enjoyment, and education which music affords. Some were good performers on an instrument; a number collected recordings; and some of us rushed from the anatomy lab at 12:00 noon three blocks over to the music school of Sophie Newcombe College for an hour of classes in music appreciation and to listen to recordings. In those days music was our food, for we had to be back dissecting the cadaver at 1 p. m."

In his book Dr. Marmelzat takes us on a brief tour of the contemporary physician-musician groups of the United States. This columnist decided to trace down a few clues in an effort to get more information on musical physicians and was soon overwhelmed by the avalanche of material from enthusiastic members.

AKRON

ONE of the oldest groups is the Akron Doctors' Symphony Orchestra. It was founded 21 years ago and was one of the few active throughout the war years. Five or six concerts are given every year.

The group originally consisted of nine physicians and two medical students and was founded by Dr. A. S. McCormick who has continued as permanent director and leading spirit.

From this beginning the group has had as members 79 medical and dental doctors and 7 doctors of philosophy, optometry, pharmacy and osteopathy. Also 102 laymen, some of whom have been with the organization many years, have all helped out in emergencies when some doctor could not be present.

A dentist, Dr. D. H. Henninger, is the present Concertmaster and a physician, Dr. A. Dobkin, is his assistant; two physicians who have been very active on the executive committee are Drs. C. R. Newton and R. E. Pinkerton.

Four of the members have composed numbers which have been played by American and British bands. Other members have played with the Cleveland and Toronto Symphony orchestras.

The orchestra maintains a professional standard musically. Director Dr. McCormick likes to tell the story of surprise meetings of members while serving overseas in the Medical Corps such as the time the Assistant Concertmaster met the bass player during the play, "Arsenic and Old Lace" in a London theatre.

NEW YORK

THE Doctors' Orchestral Society of New York City was organized by Dr. Leopold Glushak, a practicing laryngologist, who served as president for the first five years. His fellow officers were Dr. William S. Thomas, Dr. Charles Auer and Dr. Harold S. Belcher. Symphony physician members were fortunate to have as their guide the distinguished Composer-Director Ignatz Waghalter.

Rendering classical symphonic pieces by Weber, Dvorak, Wagner, Beethoven and Tchaikowsky, the orchestra made its first public appearance in Town Hall with the late Ernest Schelling, the great

American composer and pianist as the soloist.

The success of that concert greatly enhanced the enthusiasm of the members of the medical and dental professions in its activities. With its growth, Dr. James Sonnett Greene, Medical Director of the National Hospital for Speech Disorders offered his spacious auditorium, at 61 Irving Place, for rehearsals.

During the society's second annual concert at Town Hall, Doctor Glushak was featured as tenor soloist and with orchestral accompaniment sang several of Wagner's famous arias. For several years the orchestra played at medical conventions held in that city.

The war interrupted the organized work of the group but in September of 1946 the group reorganized and is again in full swing under the baton of Ignaz Strasfogel. Rehearsals are held at 61 Irving Place. Officers are Dr. Cornelius Traeger and Dr. Sidney J. Robbins.

Members of the Wayne County Medical Society Glee Club (Detroit) at rehearsal for its ninth concert, May 19, 1947, with Director Marcus Kellerman.

BOSTON

THE Boston Doctors' Symphony Orchestra is less than ten years old. A string quartet made up of doctors which met informally at the home of Dr Julius Loman, neuropsychiatrist, for the purpose of "making music a relaxation" was the nucleus of this Massachusetts group which was founded in March of 1939. The response was enthusiastic. Soon 45 doctors from Boston and neighboring cities and towns were attending. The orchestra grew to include a membership of 70 and persuaded Alexander Thiede to conduct. Forced to discontinue rehearsals during the war, the Boston group is now beginning again with Mr. Thiede, who has enjoyed a wide association with symphony orchestras.

The membership includes mainly physicians, some medical students, dentists and dental students. Weekly rehearsals are held at the studios of WMEX broadcasting station. The first and second concerts, in 1940 and 1941, were successfully presented at Boston's Jordon Hall.

Dr. Julius Loman is president of this group. His wife serves as librarian and secretary and keeps busy at rehearsals relaying telephone calls to the doctors.

The group includes many outstanding physicians. Dr. Martin Edwards, is vice president, and Dr. Robert G. Vance, who leads the horns section, is treasurer. Reading down the first violin section we find J. Loman, neuropsychiatrist; H. Cabitt, ophthalmologist; A. Biller, orthopedist; B. Alexander, hematologist; S. Gilman, anesthetist; M. Jacobs, dentist; J. Fischmann, urologist. Two physicians in general practice, Drs. M. Nigro and W. Dretler, lead the trumpet section.

BROOKLYN

THE Doctors' Musical Society of Brooklyn was organized in 1938. Members of the medical, dental and allied professions make up the roster. This original group consisted of 70 members with several nonprofessional players to fill in where needed.

Wednesday night was rehearsal night at the auditorium of the Brooklyn State Hospital with Louis Kroll as conductor. Mr. Kroll's professional experience and forcefulness as a leader guided the group into a success attained by few amateur groups.

Musicals were given twice a year. Once a year a concert was presented at the Brooklyn Academy of Music. The crowning achievement was a concert in the Ballroom of the Hotel St. George.

Orchestra personnel consisted of leaders in the various medical specialties. Dr. Harry T. Zankel, physiotherapist, was the group's founder and served as executive secretary. Dr. Martin M. Maliner, pediatrician, was president and concertmaster; Dr. Harry Hoff-

man, dentist-violinist; Dr. Maurice Bornstein, internist-violist; Dr. Louis Koenig, ophthalmologist-cellist; Dr. Benjamin Glaser, genitourinary specialist-flutist; Dr. I. Kapka, laryngologist-bassoonist; Dr. Seymour Wallach, trombonist. Drs. A. Rosenthal and A. D. Segal, surgeons, took care of the drums while Dr. Herman J. Meisel handled the piano.

SAN FRANCISCO

DOCTORS' Symphony Orchestra of San Francisco was organized by Dr. F. H. Redewill in 1938. This group, with the famous Bruno Walter as conductor, counts 80 performers. Membership according to Doctor Redewill includes: 40 M.D.'s, 16 D.D.S.'s, 22 Ph.D.'s, and one D.D. Of the total number of doctors, 70 are from San Francisco; 7 from Oakland, 3 from Berkeley, 2 from Livermore and one from Palo Alto.

Before the war the group had a full complement of instruments with Dr. Walter Beckh, a violinist, as concertmaster. Players included Drs. Hans Barken, and Dwight Shepherdson, violinists; Dr. Leo Eloesser, violist; Dr. Philip Arnot, clarinetist; Dr. Joseph L. McCool, flutist, and Dr. F. H. Redewill, oboist and clarinetist, to mention just a few of the top musicians.

Planning to reorganize this fall the group will again rehearse in their own Medical Society home, Washington and Laguna Streets. This County Medical Society home was a mansion on Washington street hill overlooking the Golden Gate.

The group's endeavor to join all physician-musicians in the United States into a national organization was checked by the war, according to Dr. Redewill, who helped to organize successfully the American Physicians' Art Association and The American Physicians' Literary Guild.

ALBANY

EMPIRE Concert Orchestra members of Albany call themselves the "Old Timers." This orchestra is unique in that it has never given a public concert.

Dr. Leonard Stanley, an Albany medical practitioner and violinist, directs the organization which meets at his home. A large tarpaulin is spread over the Oriental rugs and the men find a complete program of music laid out by the conductor for that particular night.

Among the original group were the late Dr. Howard Lomax, professor of anatomy at Albany Medical College, flutist, and Dr. John Gutman, a prominent surgeon.

Besides doctors, this group is composed of musicians who have retired from active participation in public music.

DETROIT

IN DETROIT, the Doctor's Symphony Orchestra, conducted by George Miquelle, arranged concerts before the war, along with the Wayne County Medical Society Glee Club, directed by Marcus Kellerman.

The Glee Club had its ninth concert in May with sixteen members. Officers are: Dr. Harry A. Pearse, an obstetrician; Dr. E. J. Hammer, urologist; and Dr. Leo Rennell, in general practice.

M. L. McD.

6-7

For Your Own or for a Gift Subscription

IPMA Publishing Co.
512 Essex Building
Minneapolis 2, Minn.

Beginning with your issue dated.....
Send POSTGRADUATE MEDICINE for one year to

Dr.....

Street.....

City.....Zone.....State.....

☐ $8.00 enclosed Send bill for $8.00 ☐

Official Journal of the Interstate Postgraduate Medical Association

Notes on Contributors

CLAUDE S. BECK, M.D., is a graduate of Franklin and Marshall College (A.B., 1916), and of Johns Hopkins University (M.D., 1921). In 1937 he received the honorary degree of Sc.D. from Franklin and Marshall. In 1945, Dr. Beck received the Legion of Merit. He is a Fellow of the American Society for the Advancement of Science and is a member of the American college of Surgeons, American Surgical Association, American Association for Thoracic Surgery, Society for Clinical Surgery, American Heart Association, American Medical Association, International Society of Surgery, Society for Vascular Surgery, Eastern Surgical Society, Nu Sigma Nu and the Halsted Club. Dr. Beck is the author of chapters in Nelson's "Loose Leaf System of Surgery," "Surgery of Heart and Pericardium," "Surgical Treatment of Diseases of Heart and Pericardium" (with Dr. Cutler), "Blumer Supplement to Billings-Forcheimer System of Therapeutics," "Traumatic Lesions of the Thorax and Thoracic Viscera" "Practitioners' Library of Medicine and Surgery, Vol. V, the Heart and Pericardium," "The Development of a New Blood Supply to Heart by Operation," and of more than one hundred articles in medical journals.

A.C. CORCORAN, M.D., received the B.A. degree from Loyola University, Montreal, and the degrees of M.D. and C.M. from McGill University in Montreal. He is a member of the American Medical Association, Central Society for Clinical Research, Harvey Society, American Board of Internal Medicine, American Diabetes Association, and the American Society for Research in Psychosomatic Problems. Dr. Corcoran is coauthor with Dr. Irvine H. Page of "Arterial Hypertension: Its Diagnosis and Treatment" (Yearbook Publishers).

W. JAMES GARDNER, M.D., has been a member of the staff of the Cleveland Clinic since 1929. Dr. Gardner graduated from Washington and Jefferson College with the A.B. degree in 1920 and from the University of Pennsylvania School of Medicine in 1924. He is a member of the Society of Neurological Surgeons, Central Neuropsychiatric Association, Cushing Society, Cleveland Neurological Society and Alpha Omega Alpha.

ROBERT A. GROFF, M.D., received the A.B. degree (1925) and the M.D. (1928) from the University of Pennsylvania. Dr. Groff is a member of the American Medical Association, Society of Neurological Surgeons, Harvey Cushing Society, American Neurological Association and a Fellow of the American College of Surgeons. He is the author of "Manual of the Diagnosis and Management of Peripheral Nerve Injuries" and of numerous articles on neurosurgical subjects.

PHILIP S. HENCH, M.D., chief of the Section on Rheumatic Diseases of the Mayo Clinic, is a graduate of the Medical School of the University of Pittsburgh (M.D., 1920). He also has the degree of M.S. in Medicine from the University of Minnesota (The Mayo Foundation) and the honorary degrees of Sc.D. from Lafayette College and Sc.D. from Washington and Jefferson College. During the war, Dr. Hench served as Chief of Medical Services and Director of the Army's Rheumatism Center at Army and Navy General Hospital, Hot Springs, Ark., with the rank of Colonel (AUS). He is an honorary member of the Royal Society of Medicine of London, the Heberden Society of London, the Liga Argentina contra el Rheumatismo, and the Liga Brasileira contra O Rheumatismo. Professional organizations of which Dr. Hench is an active member include the Association of American Physicians, The American Society for Clinical Investigation and the Central Society for Clinical Research.

ROY D. MCCLURE, M.D., is a graduate of Ohio State University (A.B., 1904, D.Sc., 1936) and of Johns Hopkins University (M.D., 1908). He studied at the University of Prague in Bohemia for one semester in 1906 and received the honorary degree of D.Sc. from Washington and Jefferson University in 1944. Dr. McClure is a Fellow of the American College of Surgeons, American Surgical Association, Southern Surgical Association, American Medical Association, Societe Internationale de Chirurgie, Ohio State University Association (president, 1925-27), Central Surgical Association (founder and first president, 1940-41), Detroit Academy of Surgery (president, 1929), Phi Beta Kappa (Ohio State; president, Detroit Association, 1939-42), Sigma Xi, Delta Upsilon, Nu Sigma Nu. During World War II, Dr. McClure was a member of the Subcommittee on Burns, Subcommittee on Infections, and the Committee on Artificial Limbs of the National Research Council.

CHARLES W. MAYO, M.D., graduated from Princeton University (A.B., 1921), University of Pennsylvania Medical School (M.D., 1926) and received the M.S. in surgery from the University of Minnesota Graduate School of Medicine in 1931. Dr. Mayo holds membership in the American Board of Surgery (Founders' Group), American Surgical Association, Western Surgical Association, Southern Surgical Association, American Medical Association, Minnesota Surgical Association, Minnesota Academy of Medicine and is a Fellow of the American College of Surgeons.

IRVINE H. PAGE, M.D., whose work is directed to internal medicine and research in cardiovascular renal disease, took both his undergraduate and medical training at Cornell University. Dr. Page is the author of "Chemistry of the Brain" (Charles C Thomas), "Hypertension, A Manual for Patients" (Charles C Thomas), and "Arterial Hypertension: Its Diagnosis and Treatment," written in collaboration with Dr. A. C. Corcoran (Yearbook Publishers). Dr. Page is a member of the Central Society for Clinical Research, Harvey Society, New York Academy of Medicine, American Board of Internal Medicine, American Society for Research in Psychosomatic Problems, American Heart Association, American Medical Association, Society for Experimental Biological Medicine, American Chemical Society, American Physiological Association, and Sigma Xi.

R. D. TAYLOR, M.D., graduated from the University of South Dakota with the B.S. degree and completed his training at Depauw University, State University of Iowa and Northwestern University Medical School. He is a member of the Cuyahoga Medical Society, American Medical Association, Central Society for Clinical Research, American Federation for Clinical Research, American Physiology Society, and the American College of Physicians.

OLIVER S. WAUGH, M.D., F.A.S.C., was granted his degree from McGill University. He holds the position of professor of surgery at the University of Manitoba and is director of the Department of Surgery of Winnipeg General Hospital. Dr. Waugh is chief consultant in neurosurgery of the Department of Veterans' Affairs in Winnipeg and is consultant in neurosurgery of Children's Hospital in Winnipeg. He is a member of the Winnipeg Medical Association, Canadian Medical Association and a Fellow of the American College of Surgeons.